MAY 15, 1961

American Machinist / Metalworking Manufacturing

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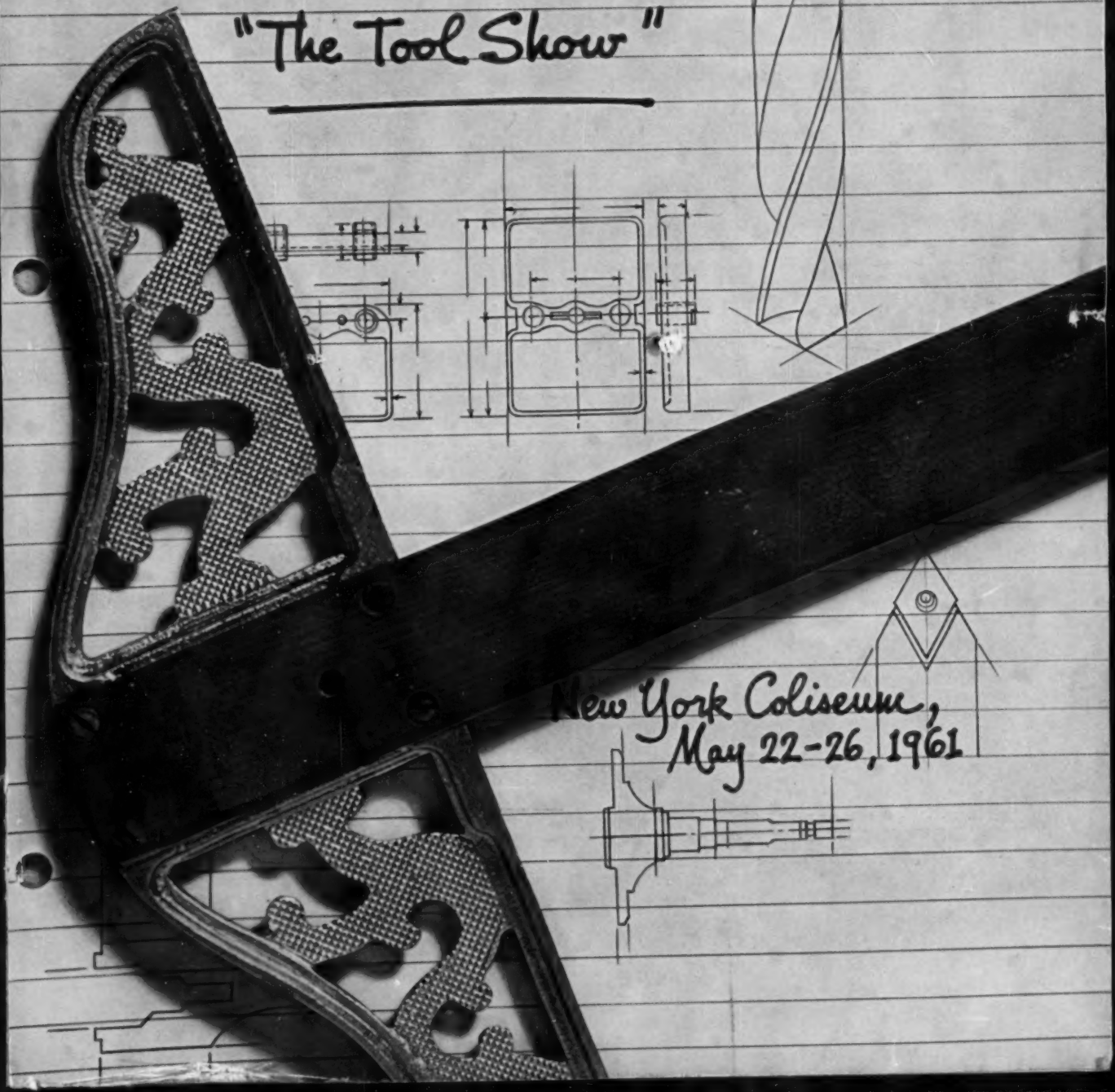
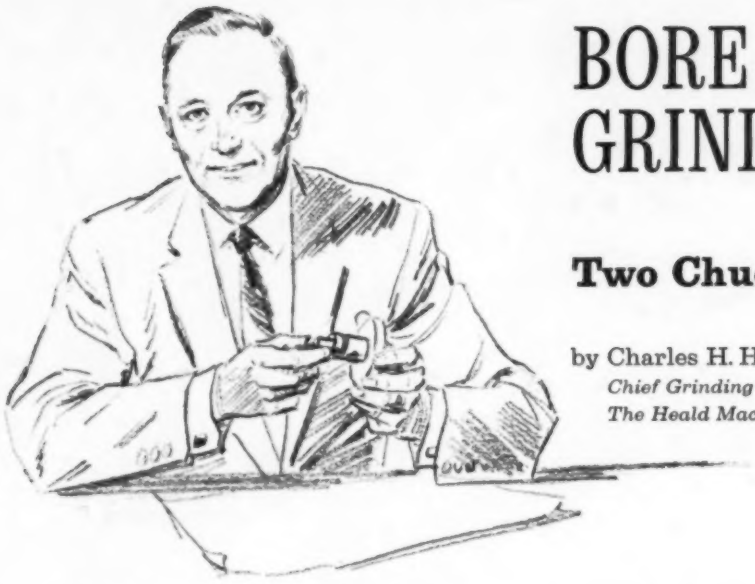
Your complete guide to

"The Tool Show"



New York Coliseum,
May 22-26, 1961



BORE AND FACE GRINDING...

Two Chuckings or One?

by Charles H. Hall
Chief Grinding Engineer
The Heald Machine Company

Many parts that call for an internal grinding operation also require precision finishing on an adjacent or associated face. This poses no particular problem, of course, and it usually presents an opportunity to make substantial savings by combining the two operations on a single machine.

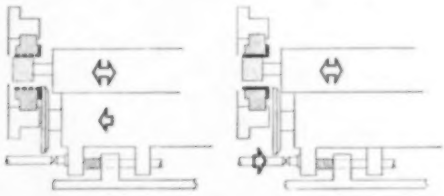
The conventional method of grinding the bore on one machine and the face on another has some inherent disadvantages. It means two separate loading and grinding operations plus additional handling between machines. And since two chuckings are involved, the relationship between bore and face is subject to squareness variations which may or may not be serious.

If, on the other hand, the bore and face can be done at a single chucking, total floor-to-floor time can be greatly reduced. But even more important is the fact that squareness between bore and face can be positively assured.

Combined bore and face grinding has been standard procedure with certain types of work on Heald two-spindle internals for many years. Several different methods can be employed, each of which has its own merits for a particular application.

Where cycle time must be kept to the minimum, slide-bar facing offers maximum efficiency and economy, for both surfaces are ground *simultaneously*. One wheelhead unit mounted on anti-friction slide bars holds the facing wheel in grinding position while a second wheelhead unit reciprocate grinds the bore.

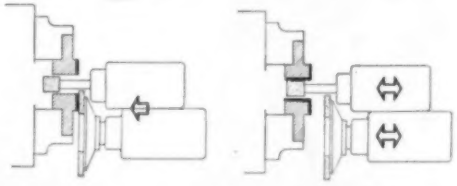
Where high production requirements are not a limiting factor, initial machine cost can be lowered by using a two-spindle machine arranged for sequential bore and face grinding, either with or without indexing of the wheelheads. Where bore tolerances are extremely close and indexing is not desired, fixed wheelheads can be arranged to permit manual plunge facing while the bore wheel enters the work without touching it. The table is then backed off to reciprocate-grind the bore.



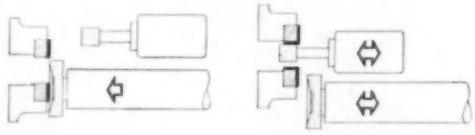
Diagrams of slide-bar facing arrangement showing semi-finish bore grinding and face grinding at left and finish bore grinding at right.

Where indexing is permissible, a retractable facing head is often used. After the work is plunge faced, the facing head is retracted and table is indexed to align the bore wheelhead unit with the hole. This arrangement provides maximum versatility and permits the machine to be used as a bore grinder, a face grinder, or a combination of both.

Whatever your requirements for bore and face grinding, it is probable that one of these two-spindle arrangements can be applied with a substantial reduction of initial investment, lower floor-to-floor cycle time and an improvement in quality as well.



Diagrams of sequential bore and face grinding with fixed wheelheads, showing face grinding at left and bore grinding at right.



Diagrams of sequential bore and face grinding with retractable facing head and cross slide indexing, showing face grinding at left and bore grinding at right.

Ask your Heald engineer for further details, or send for Bulletin 2-69-2. **It PAYS to come to Heald.**

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

WORCESTER 6, MASSACHUSETTS

CIRCLE 251 READER SERVICE CARD

COVER:
Design for the 1961 Tool Show Issue was created by Art Director Joe Poznanski.

American Machinist / Metalworking Manufacturing

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TURN PAGE FOR METALWORKING REPORT ⟶

METALWORKING REPORT

. . . what's new and significant in manufacturing techniques and materials—direct from our own staff and round-the-world news bureaus

MATERIALS . . . Zerolling of stainless steel produces some remarkable increases in tensile and yield strengths. In this process, started some seven years ago by International Nickel Co, then dropped and recently resumed, **stainless steel sheets are rolled after cooling them to —105 F.** Rolling has been applied to the 301 and 304 alloys. After treatment, the **alloys are virtually impossible to work by conventional tools.** One large tank manufacturer is said to be experimenting with explosive forming.

INSPECTION . . . New gamma ray system continuously detects minute flaws in steel up to 4 in. thick and projects images of the flaws on a TV screen. The system, which was developed jointly by the Rauland Corp, subsidiary of Zenith Radio Corp, and Picker X-Ray Corp, **uses cobalt 60 as the gamma ray source.** Because the system will eliminate much shearing off of slab ends, it **should bring substantial savings to rolling mills.** Other applications are for solid propellants, molten metal in pipes, and castings.

FINISHING . . . Programmed, automatic electroplating machine is controlled by one man at a central panel. It can be arranged for a variety of transfers, delayed dips, barrel rotations, dwell periods, and power; however, **each individual barrel and carriage assembly can be controlled separately.** Known as the VIP (variable, integrated processing), the machine from Udylite Corp, Detroit, allows programming of barrels through processing and plating tanks at different rates of speed, keeping the plating full at all times. **Coverage and thickness of deposit are reported uniform, maintenance costs are 70% less.**

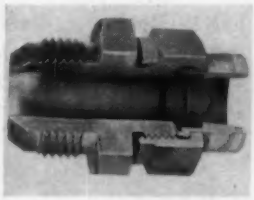
CUTTING . . . New "welded diamond" bonding technique bonds industrial diamonds to steel tool shanks in **extremely high vacuum.** According to Vacuum Research Corp (Forest Hills, NY), the process does not produce surface or internal stresses in the diamond, and **up to 75% of the stone can protrude and still maintain a good bond.** A 0.25-karat diamond tool was in perfect condition after fifty 0.001-in.-deep passes across a 4-in.-wide silicon **wheel.**

HEAT TREATING . . . Warping of heat-treated Rene 41 and titanium parts during machining can be minimized, sometimes eliminated, by inverse quenching in a fluidized bed. Inverse quenching (*AM*—Dec 28 '59, p2) relieves residual stresses by subjecting a heat-treated part to thermal gradients just the opposite of those it underwent during heat treatment. Process was originally applied only to aluminum alloys, but now Boeing has found that **Rene 41 and titanium can be thermally shocked by the rapid heat transfer** that occurs when a cold part is suddenly heated.

MANUFACTURING CONTROL . . . Seven men saved more than $200,000 in three months. That's the record of a program—called VIP, for Value Improvement Program—headed by seven specialists at the Lockhead Missiles & Space Div. **Each man, an expert in his own field, does full-time VIP work** on any engineering, purchasing, or production troubles that crop up. The team's services are available to any group in the Van Nuys, Calif operation.

FORMING . . . An oil-inflated diaphragm gives added control and accuracy during rubber-die work on large presses. This new rubber component, designed by General Tire in conjunction with Hydraulic Press Mfg Co, fits on top of the rubber pad. When oil at 6500 psi is pumped in, the **diaphragm acts as a more flexible "fluid" die** to wipe the metal against the punch or form block. Little or no hand-finishing is required.

COMPONENTS . . . Metal-to-metal seal makes this coupling safe for all liquids and gases up to 700 F at 5000 psi. The Dynatube also remains leak-proof under cryogenic conditions, according to Resistoflex Corp, Roseland, NJ. A special groove (see illustration) **forces two beveled surfaces even closer together under high pressure;** thus, the coupling has withstood hydraulic impulse pressure peaks as high as 7500 psi.



INSPECTION . . . New vibration monitor can "hear" a cat walking on carpet 40 ft away, because it is so sensitive that it **measures amplitudes as low as 0.000,002 in.** Series 18 Operation Monitors, being introduced at the Tool Show by RayData Corp, Columbus, Ohio, have a frequency range between 2 cycles a sec and 10 kc/sec. They are **applicable to vibration analysis of machine tools** or to any process in which off-normal conditions can be described by a change in frequency or amplitude.

CUTTING . . . Sectional die blocks and simple cutting tools can be precision profile ground by a technique developed years ago in Germany but seldom used in this country. The **entire contour can be ground in a single setup** through a clever combination of optics and mechanics. See story that starts on p134 for more details.

FINISHING . . . Super centrifuge developed in Czechoslovakia develops over 72 million G's to test adhesion of surface coatings as well as strength of solid masses. The 10-mm-dia **rotor has no bearings, but is suspended magnetically.** Operating in a vacuum, it will develop up to 3.6 million rpm.

MATERIALS . . . Tube transition joints between difficult-to-join metals, such as stainless steel and titanium or columbium, mild steel and Zircaloy, or Inconel and Zircaloy, **are being produced in prototype quantities** by Nuclear Metals, Inc, Concord, Mass. These joints are expected to be useful wherever a transition must be made between two metals, in tubing, to take advantage of the properties of both. Sizes range from 0.060 to 3.5-in. dia and 0.012 to 0.250-in. wall thickness.

Continued on next page

Coming in AM/MM

How Modern Is America's Metalworking Equipment?

AM/MM editors estimate the degree of obsolescence today, at the halfway point between AM/MM's 8th Inventory taken in 1958 (60% of cutting type machine tools were over-age then) and the 9th Inventory due in 1963

METALWORKING REPORT . . .

CUTTING . . . Magnesium crankcases must be machined in steps on the transfer line in Volkswagen's new engine plant at Hanover, Germany. Because the metal has such a high coefficient of thermal expansion, it is necessary to **reduce depth of cut and allow cooling time between cuts to prevent distortion.** Details of this operation will be reported in an early issue; other innovations at Volkswagen are described starting on p141.

FINISHING . . . Corrosion resistance improves 20 to 90% in industrial and marine atmospheres if small amounts (0.04 to 0.05% by weight) of magnesium are added to galvanizing baths. After a 6-yr testing program, Dow Chemical reports that there is **no difficulty in maintaining magnesium in the bath,** that galvanizing operations are facilitated in such areas as drainage and icicle formation, and that **increased cost is negligible.**

MATERIALS . . . Uniform micropowders of refractory compounds have been produced at the research laboratories of Linde Company, div of Union Carbide Corp. **Refractories such as columbium carbide and titanium carbide** less than 44 microns in size, and of homogeneous composition, have been made. These micropowders are solid, uniform in particle size and composition, and do not agglomerate. One ounce samples are available for research.

WELDING . . . Gas welding can be done with propane, say the Russians, who have developed a **special torch that runs the propane through a preheating chamber** before it reaches the main heating chamber. They claim flame temperature as high as oxy-acetylene, but experts here say the oxy-acetylene flames can be boosted, too, with special techniques. **Russian design was prompted by shortages of acetylene** in remote areas and apparently is not intended to replace acetylene.

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CINCINNATI

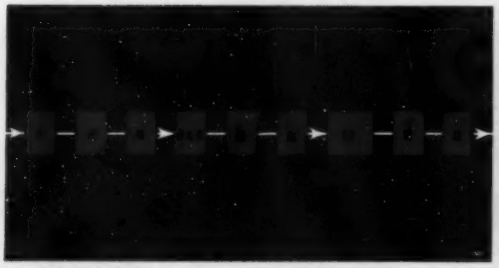
CINCINNATI | SPECIAL MACHINE DIVISION

plans and develops low-cost production tours

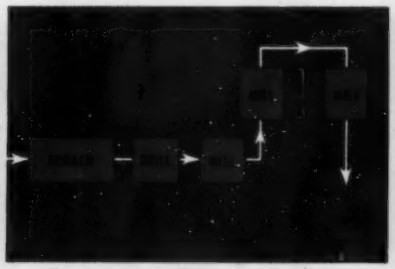
PRODUCTION "TOURS" planned and developed by Cincinnati give you a fresh outlook on how low production costs can really be. The work may progress from one operation to the next in a straight line, U-turn or circle.

One giant 36-Station Transfer Line built by Cincinnati automatically machines V-6 and V-12 cylinder blocks. The blocks move through the world's largest broaching machine, then follow a straight line through drilling and milling stations, finally taking a space-saving U-turn through two more milling stations. In another Cincinnati production line, aluminum transmission cases follow a straight path while receiving 33 machining operations. Some types of parts are particularly adapted to a circular production tour. Cincinnati's Special Machine Division has built many machines of this type, some for milling, others for milling and drilling, while still others include a free broaching operation. Examples are illustrated on the next two pages.

Whatever your metalworking requirements, you can be sure that Cincinnati's 47 years' experience in building automatic machines and production lines will result in the lowest production cost and the highest degree of dependability. **Special Machine Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.**



• Straight Line



• Straight Line and U-Turn

• Rotary Index

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DESIGNERS AND BUILDERS OF
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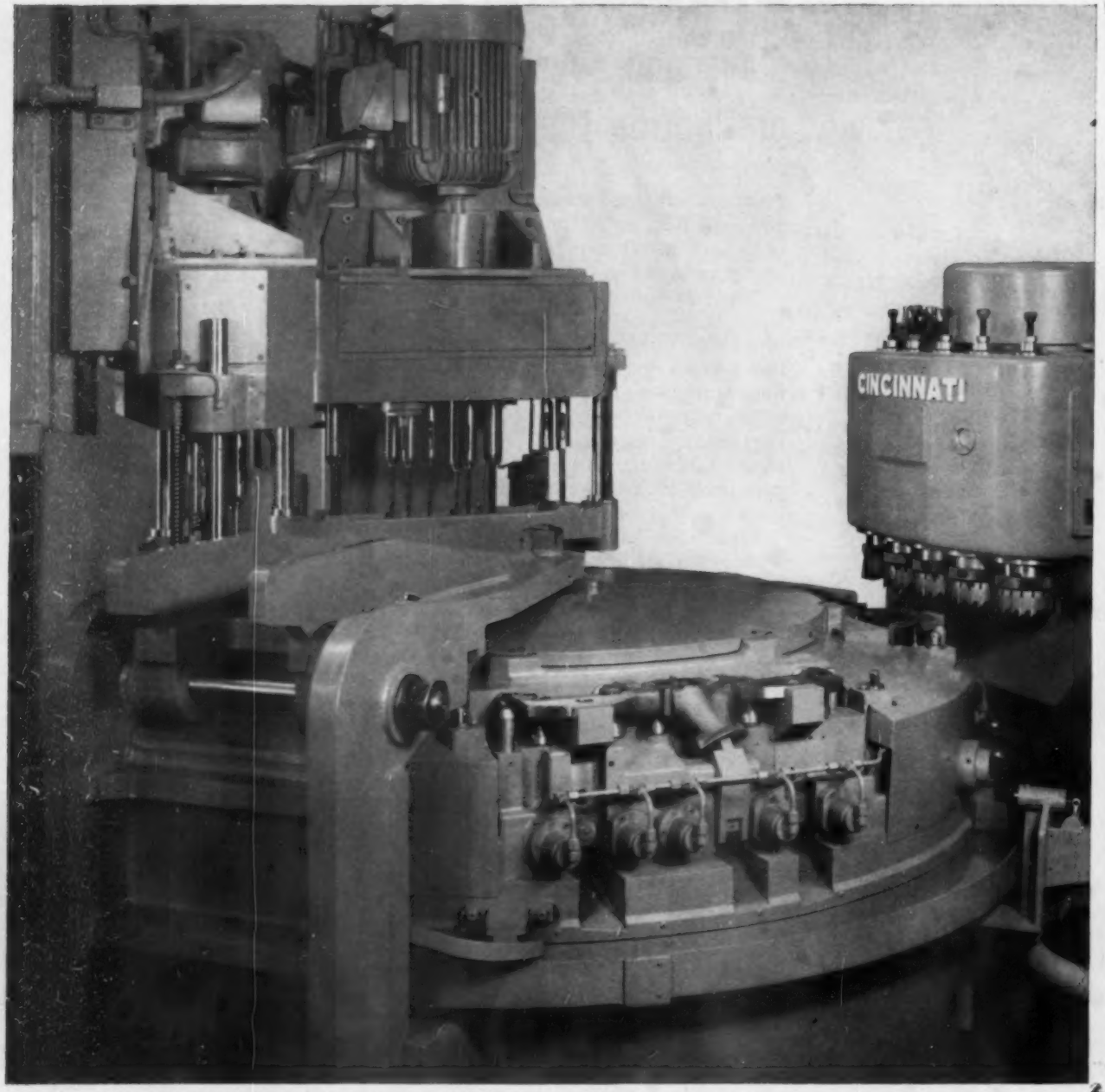
CINCINNATI Rotary Index Machining proves

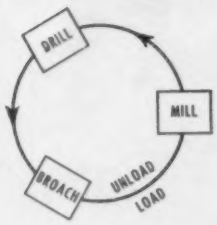


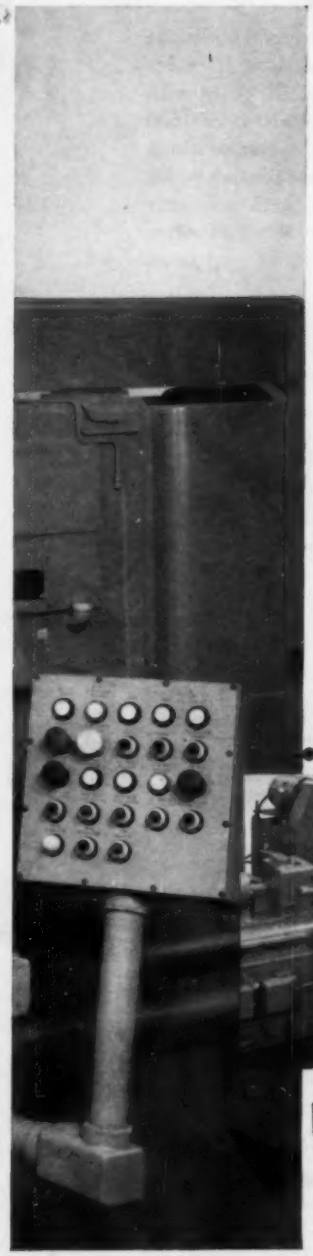
Milling, drilling and broaching operations are completed on exhaust manifolds at a production rate of 105 parts per 48 minute hour. Broaching is free, performed during the rapid index segment of the cycle.

DESIGNERS AND BUILDERS OF SPECIAL MACHINES • HORIZONTAL BROACHING MACHINES •

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

that the shortest distance between two points is often a circle

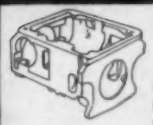




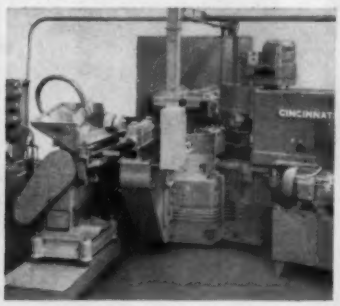
Three basic "tours" to low-cost production are highlighted on the preceding page. Let's consider one of them more fully: the circular tour. Take a conventional straight production line, bend it into a circle, and you have the basic idea of CINCINNATI Rotary Index Machines. These unique machines perform several operations, taking the work in a circular path which becomes the shortest distance traveled to achieve low-cost production.

Cincinnati's Special Machine Division has built many highly successful machines of this type. Four are illustrated here. All include standard time-tested mechanisms which are used in other Cincinnati machines. And all incorporate the "building block" approach to construction, which reduces lead time . . . allows replacement of modules or units if required by design changes.

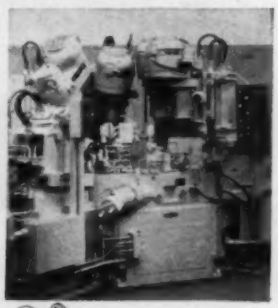
Cincinnati is staffed and equipped to build all types of numerically controlled equipment and automatic machines or production lines having any desired degree of automation. May we help you?

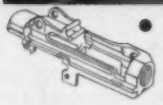


Milling, drilling and reaming operations are performed on transmission cases at the rate of 85 cases per 48 minute hour.



Automatic loading and unloading keep this CINCINNATI busily performing three operations on 600 cotton picker spindles per hour.





Thirty separate milling operations on complex gun receivers are performed by six CINCINNATI Station Type Rotary Machines.

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COMPLETELY AUTOMATED PRODUCTION LINES

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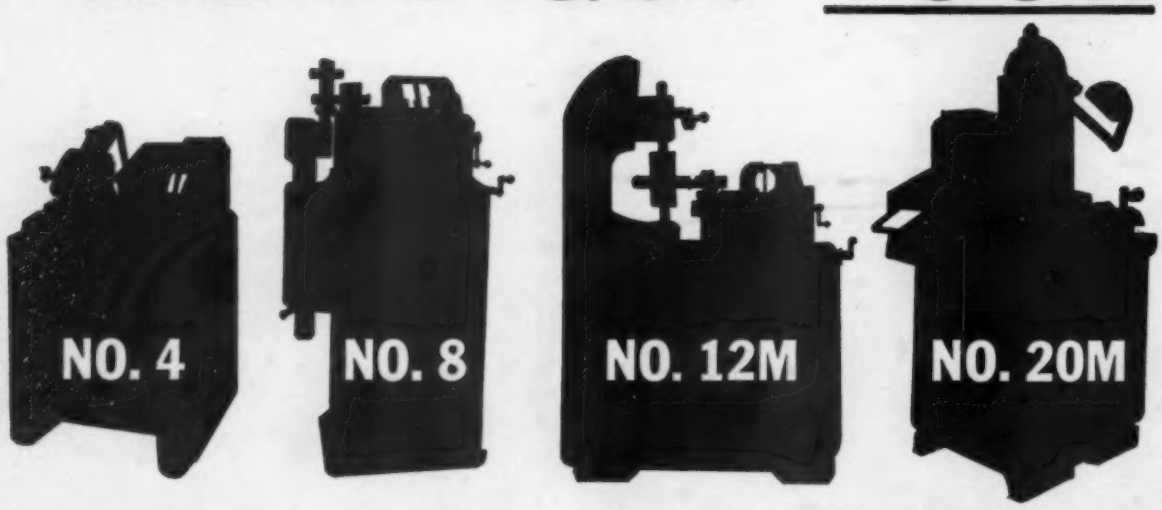
SPECIAL MACHINE DIVISION

On these pages you'll find the number of the FELLOWS gear inspection instrument that precisely matches your needs.

In fact, right from the gear blank to the finished external or internal spur or helical gear, FELLOWS has a complete line of gear production *and* inspection equipment.

One of the most important FELLOWS developments is the No. 4 Red Liner for fine-pitch gear inspection. It makes "composite" checks on the finest instrument gears with remarkable accuracy and sensitivity. Magnifications of 1600 to 1 are obtained thru the electrical recording system which provides a written, unbiased record for instant reading or for proof-of-accuracy files. It's the *best* way to check tiny gear components such as that shown actual size at top of right-hand page . . . a 22-tooth, 96 D.P. pinion backed up to an 80-tooth gear on a cluster.

WE'VE GOT YOUR



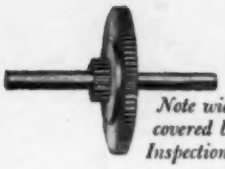
NO. 4 FINE PITCH RED LINER. For composite check of external and internal spur and helical gears. Maximum P.D.– 4″.

NO. 8 RED LINER. For complete check of external and internal spur and helical gears. Maximum P.D. depends on design.

NO. 12M INVOLUTE MEASURING. For external and internal spur and helical gears. Maximum P.D. — 12″. No. 24M — 24″ cap.

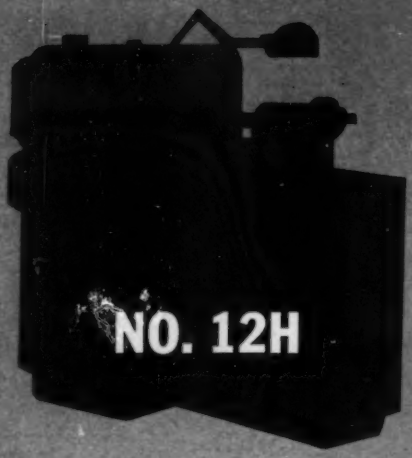
NO. 20M RED LINER. For complete check of external and internal spur and helical gears. Maximum P.D. — 18″.

Keep *your* production and inspection operations efficient and economical with today's most advanced gear manufacturing equipment. Get complete details on FELLOWS equipment from your nearest FELLOWS branch office.



Note wide range of size covered by Fellows Gear Inspection Equipment.

NUMBER



NO. 12H LEAD MEASURING. Continuous-originating type lead measuring of external and internal helical gears. Maximum P.D. —12". No. 24H has 24" capacity.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices:
1048 North Woodward Ave., Royal Oak, Mich.
150 West Pleasant Ave., Maywood, N. J.
5835 West North Avenue, Chicago 39
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THE PRECISION LINE

Fellows

Gear Production Equipment

HIGH WHEEL SPEEDS ?

Over the years Landis has supplied many cylindrical grinders with high wheel speeds... but only to fit the job requirement.

If you need 8500 SFPM on your next Landis grinder, it is available. As always, our engineers will recommend the best speed to grind your workpieces efficiently.

LANDIS

world leader in precision grinders

LANDIS TOOL COMPANY WAYNESBORO, PA.

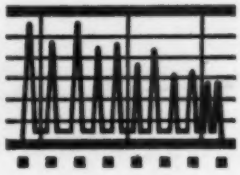
IF you want to control

and improve the quality of your product

with measurements displayed

on a dial . . . in an air column

or in signal lights

on a panel 3.9275 or a chart 

See them at Booth 1414, Tool Show, May 22-26

there'll be no IF in the results

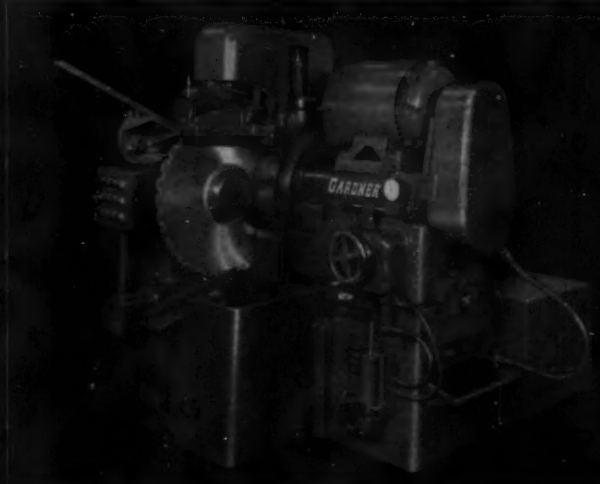
when you measure with Sheffield gages

The SHEFFIELD Corporation Dayton 1, Ohio

A subsidiary of The Bendix Corporation

from the world's most complete line of disc grinders:

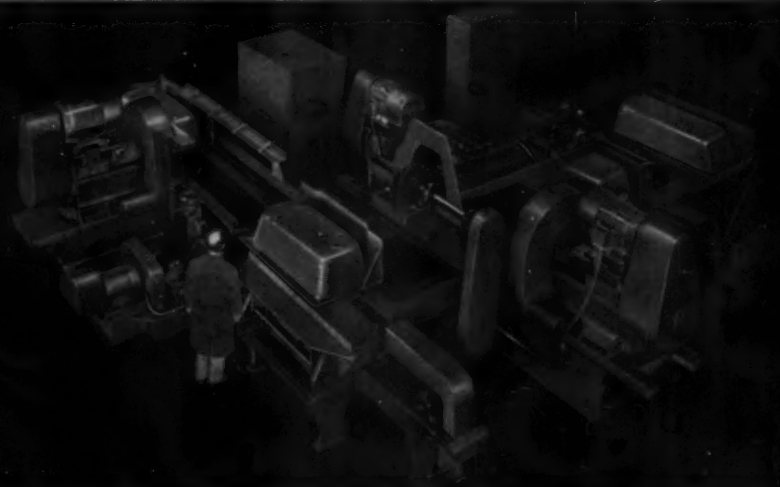
standard and specially engineered machines for a wide variety of disc grinding jobs



Consistently close tolerances, high rate of production on precision double spindle disc grinders. Five sizes available.

Single spindle disc grinders for production grinding single surfaces. Manual and power operated work-carrying fixtures available.

Grind small precision parts at high production on this vertical double spindle disc grinder which grinds two surfaces parallel in one operation.



Grind unusual workpieces—like bathtubs—on Gardner Special Purpose Grinders which grind surfaces parallel, generate curved surfaces, single or multiple surfaces.

GARDNER

precision disc grinders

GARDNER MACHINE COMPANY, BELOIT, WISCONSIN

a subsidiary of Landis Tool Company

Mitre gears are typical of the heavy metal removal problems at United Engineering. Large stock allowances and tolerances of .001"—often on the same part—place special value on the 3AC's ability to rough and finish in one operation.

AT UNITED ENGINEERING & FOUNDRY CO.

Youngstown, Ohio

1" deep cuts and .001" tolerances no problem on rugged 3AC Automatic

The 3AC's hefty "spider" is finish ground on an arbor to establish precise index accuracy of the machine's pentagon tool slide.

A Warner & Swasey heavy duty Chucking Automatic outproduces large turret lathe 4 to 1 on 15" diameter bevel gears

Heavy machine usage is not at all unusual at the Youngstown plant of United Engineering & Foundry Company, a leading producer of mammoth special purpose machinery for the steel and nonferrous metals industries. To cut their costs on work involving heavy stock allowances, close tolerances and small lots, United installed a Warner & Swasey 3AC Chucking Automatic. This machine's proven accuracy, metal removal capacity, fast setup and tooling flexibility ideally met their needs.

The 3AC, now working two and three shifts on 20 to 100-piece lots, involving 1" deep cuts in bores, ½" wide facing cuts, and 1½" wide form cuts has increased production on 15" diameter bevel gears from 3 to 4 pieces a day to 14 to 16 a day.

Perhaps similar benefits await you. Why not go over your tough metal turning problems with a Warner & Swasey Field Engineer? Warner & Swasey Company, Cleveland 3, Ohio.

YOU CAN TURN IT BETTER, FASTER,
FOR LESS...WITH A WARNER & SWASEY

WARNER & SWASEY

CIRCLE 260 READER SERVICE CARD

HARDINGE
ELMIRA, N.Y.

MASTERS and PADS

FOR BETTER PERFORMANCE — BETTER PRODUCTION

AND

PROFITS

STYLE "S"
MASTER COLLETS and PADS
The Only Master Collet with
No Work Pressure On The Screw
Available For: Cleveland-Cone
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Write for FREE Bulletins

STYLE "B"
MASTER FEED FINGERS and PADS
Pads Cannot Work Loose
No Screws — No Pins
Available For: Brown & Sharpe
Cleveland—Cone—Davenport—Greenlee
Gridley and Acme-Gridley—National Acme
New Britain—Warner & Swasey

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HARDINGE BROTHERS, INC., ELMIRA, N. Y.

HARDINGE
ELMIRA, N.Y.

HARDINGE Sjogren Chucks

Quality at Low Cost

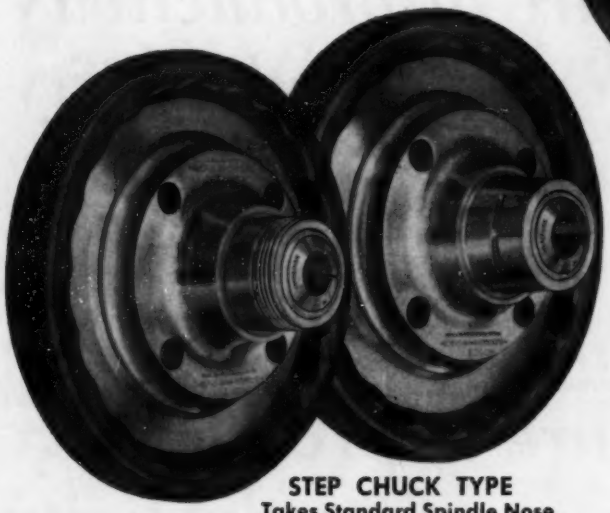
HARDINGE-SJOGREN Speed Collet Chucks for tool room lathes, engine lathes and grinders.

Available for Threaded Nose, Cam Lock, Taper Key Drive and American Standard Spindles.

REGULAR TYPE

AVAILABLE IN FIVE COLLET CAPACITY SIZES

1 1/16", 1 3/8", 1 3/4", 2 1/4", 3 1/2"



STEP CHUCK TYPE
Takes Standard Spindle Nose Accessories As Used With Hardinge Precision Machines

LEVER TYPE

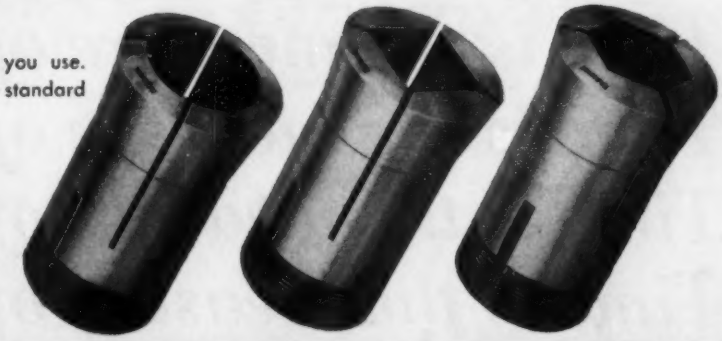
Ask Your Hardinge Representative or Local Distributor For Bulletin 88

HARDINGE
ELMIRA, N.Y.

HARDINGE Low Cost Steel Collets

Maximum efficiency — Pay for only what you use. Records show that 82% of all sizes used are standard 16th sizes.

Atlanta, Boston, Chicago, Dayton, Detroit, Elmira, Hartford, Los Angeles, New York, Philadelphia, Seattle, Portland, Minneapolis, Oakland, St. Louis, Springfield, N. J., and Toronto.



HARDINGE BROTHERS, INC., ELMIRA, N. Y. U.S.A.

Time is the measure of productivity

Time is the measure of productivity
Time is the measure of productivity

Time is the measure of productivity
Time is the measure of productivity
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Time is the measure of productivity

Reduce grinding time and you increase productivity. Norton's many time saving innovations in varied stages of grinding production can reduce your grinding time up to 30%! The story is a profitable one. Here's why —

Norton Grinding Machines are engineered to permit higher wheel speeds to reduce cutting time. Norton's *Automatic Wheel Balancer* balances the wheel in *five seconds— on the machine.* You reduce time spent "grinding air" up to 85% because of Norton's *Automatic Wheel Contact Accelerator* which speeds the wheel to the work and compensates for work piece-diameter variation. Another advance is Norton's *Automatic Truing* which eliminates work interruptions and the *Automatic Wheel Wear Compensator* that stabilizes the grinding cycle.

Norton Grinders further add to your productivity by minimizing work spoilage with *Automatic In-Process Gaging.* In the case of surface grinders Norton *Higher Table Speed of 150 fpm* actually reduces grinding time up to 50%.

These are only some of the many reasons you can increase your productivity with Norton Grinders. They also offer accessories that literally transfer skills to machines — *ultra-fine feed,* and *automatic features* such as *steady resting, endwise locating, loading, constant peripheral wheel speed* and *hydraulically-operated feed screws* provide this competitive advantage.

The decision is yours — can you afford not to reduce the time it takes to produce your product? Can you afford not to increase your productivity? Contact your Norton man, NORTON COMPANY, Machine Tool Division, Worcester 6, Mass. District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit. In Canada: J. H. Ryder Machinery Co. Ltd., Toronto 5.

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MACHINE TOOL DIVISION: Grinding and Lapping Machines — **G & E DIVISION:** Shapers • Gear Cutting Machines

NORTON
MACHINE TOOLS

Making better products . . . to make your products better

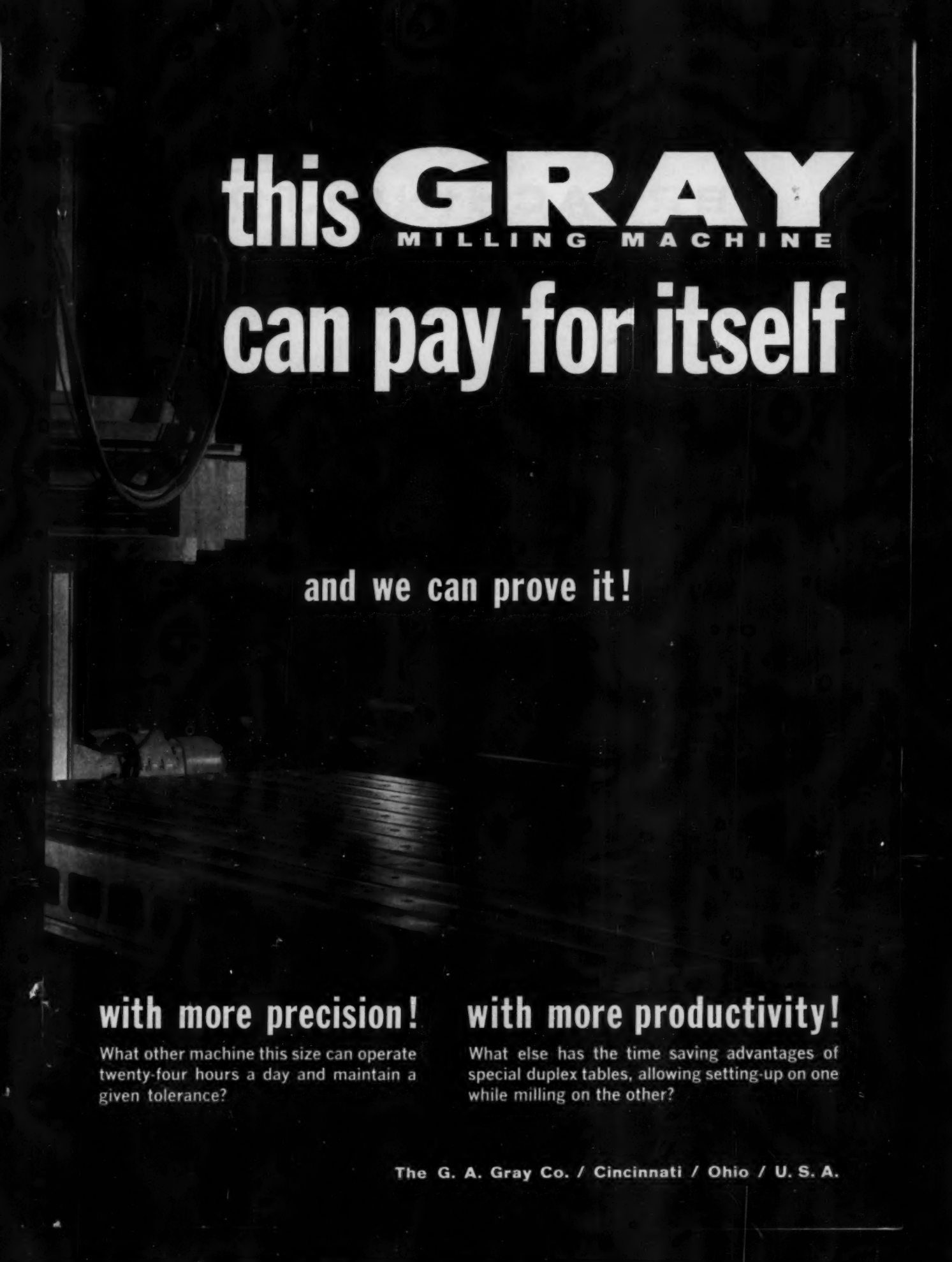
with more cutting power!

What other milling machine—planer type, has the flexibility of four 75 H.P. units heads, pouring a total of 300 H.P. into the job?

with more control!

What else has a numerical control positioning system that gives visual indication of movement of railheads and table?

horizontal milling and boring machines / planers / milling machines—planer type


this GRAY
MILLING MACHINE
can pay for itself
and we can prove it!
with more precision!
What other machine this size can operate twenty-four hours a day and maintain a given tolerance?
with more productivity!
What else has the time saving advantages of special duplex tables, allowing setting-up on one while milling on the other?
The G. A. Gray Co. / Cincinnati / Ohio / U. S. A.

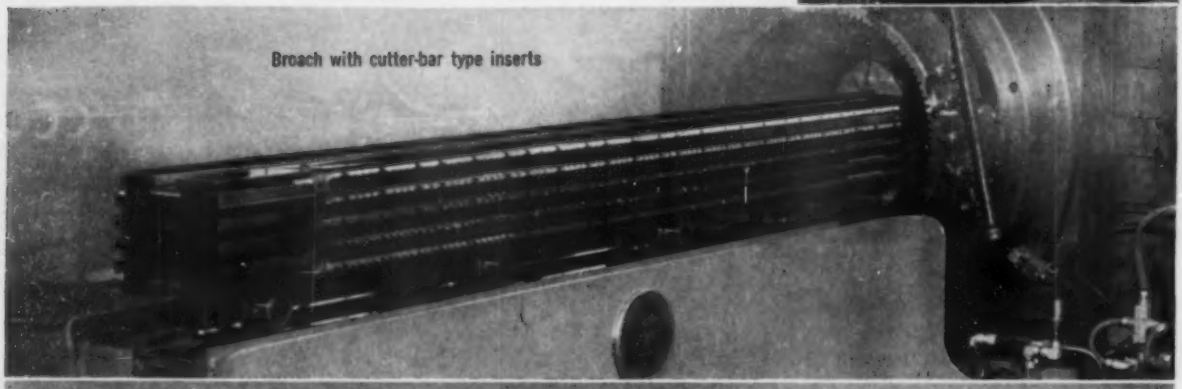
Say!...you forward-looking engineers
who are investigating numerical control:

LAPOINTE

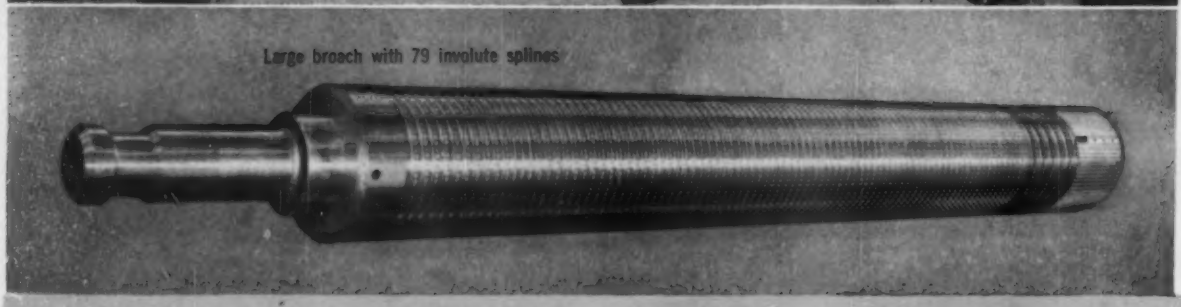
BROACHING TOOLS••

have offered you the
basic advantages of numerical control
for nearly 60 years!

Pot-type broach showing
broached camera lens attachment

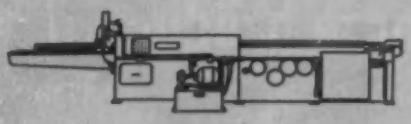


Broach with cutter-bar type inserts

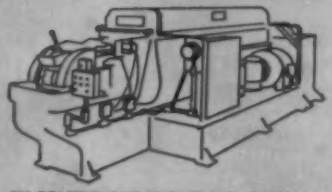


Large broach with 79 involute splines

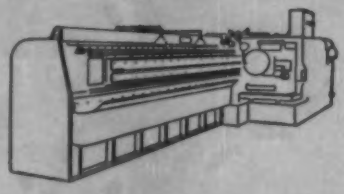
Lapointe-built Broaching Machines are available in hydraulic and electro-mechanical drives.



60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC

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▲ CIRCLE 267 READER SERVICE CARD

....AND FIXTURES

Look at these striking cost-reduction features, available to the metalworking industry through Lapointe-Broaching . . . the identical advantages claimed for numerical control: • Saves set-up time • Good for short runs • Can use inexperienced operators • Eliminates errors and production of scrap parts.

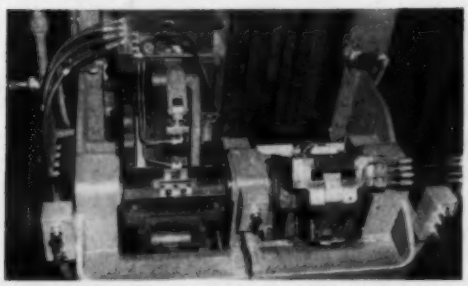
By using Lapointe Broaching Tools and Fixtures you get all the accuracy demanded by a difficult contour. You get close missile-type tolerances, fine finish. It's virtually "built-in numerical control" for the repetitive production of any simple or complicated part. (And it's far less costly, for equipment!)

The greatest potential for cost reduction exists in the field of Lapointe-Broaching. We earnestly suggest that you invite an experienced Lapointe Field Engineer to show you how to save money in your plant through the use of Lapointe-Broaching.

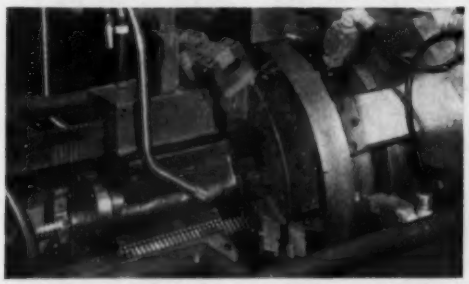
THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

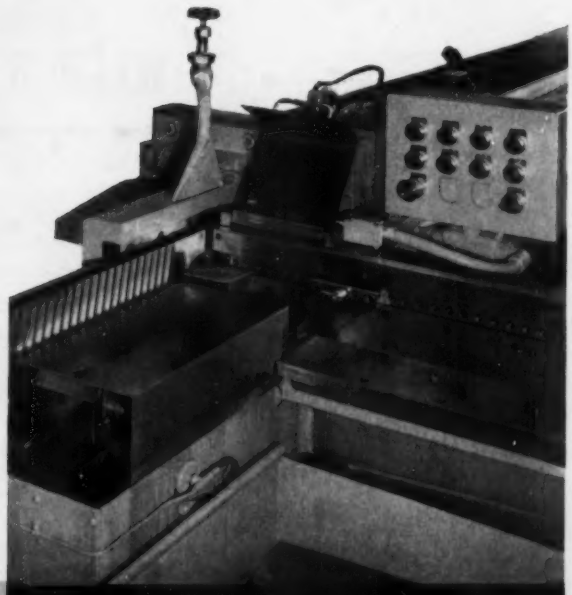


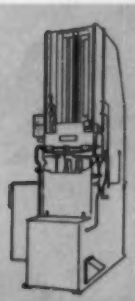
For surface broaching a compressor body, this work-holding fixture has hydraulically operated clamping mechanism.



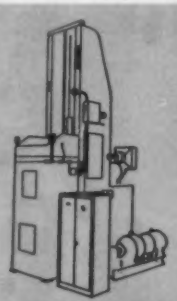
Rotary type 3-station holding fixture, for broaching progressive internal cuts in the work piece, without handling.

Vise-type fixture, hydraulically operated, for squaring ends on work up to 6" square.

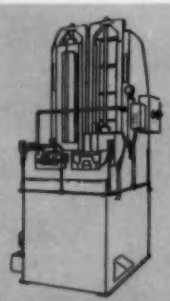




VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

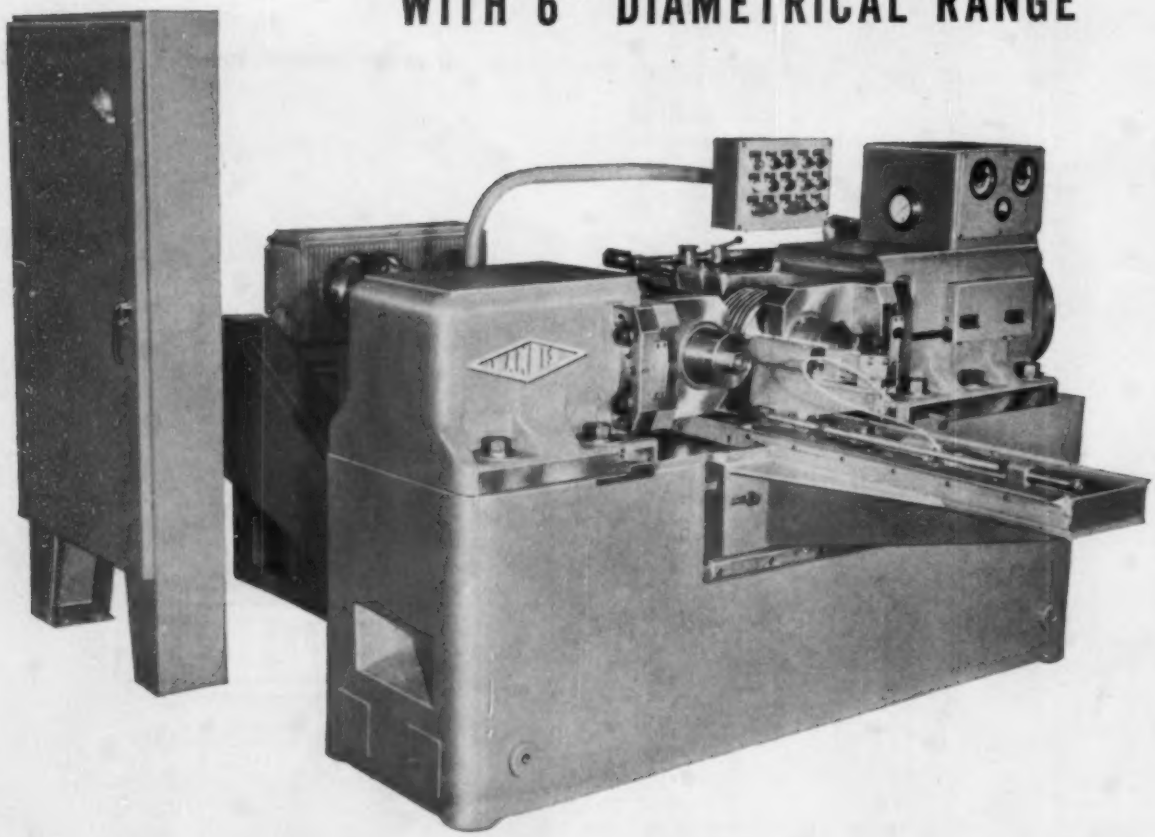
known to be the best in

BROACHING

THREAD ROLLING MACHINE

delivers 200,000 pound rolling force

WITH 6" DIAMETRICAL RANGE



NEW

. . . from Landis Machine Company, the world's largest manufacturer of threading equipment, comes the HY-DUTY Thread Rolling and Forming Machine. With an all-steel bed, it is designed for the heaviest thread, form, spline and gear rolling applications . . . even those requiring rolling forces of up to 200,000 pounds.

With hydraulically operated, infinitely regulable and electronically-controlled infeed cycling and variable infeed stroke length, the machine is exceptionally versatile in application. It offers power, rigidity and speed for maximum efficiency within its rated capacity. The HY-DUTY will thread and form up to 6" maximum diameter INFEED, and up to 4" maximum diameter THRUFEED. A full complement of automatic feeding and tooling equipment is available for rolling by either method.

The HY-DUTY Machine complements the medium size LANHYROL and small LAN-NU-ROL Thread Rolling Machines allowing LANDIS to offer a complete line of thread rolling equipment. Whatever your thread rolling requirement, there is a LANDIS machine or tool to do the job. This is the result of over 55 years of experience in the threading field. For additional information about the HY-DUTY Machine, contact your LANDIS Representative (in all leading cities) or write direct for Bulletin E-104.

HY-DUTY FEATURES:

- Manual, semi-automatic and automatic die cycling
- High infeed cycling rates—up to 25 strokes per minute (fully automatic)
- Two die design to minimize set-up time and auxiliary equipment
- 50/25 H.P., 1800/900 R.P.M., motor and 12 spindle speeds ranging from 39 to 476 to provide the power and speed to efficiently roll all diameters within the machine's range
- Maximum thread lengths of 11½" for Infeed rolling, up to 20' Thrufeed
- Roll holders inclinable to 10° in either direction to include the helix angle of any standard AN/UN or Acme thread within the Thrufeed capacity of the machine
- 3" steel plate major bed for maximum mechanical stability
- Worm gear transmission and speed change gear box rated 90% efficient at maximum speed with overload capacity of 100%

LANDIS Machine COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT

ANOTHER NORTON PRODUCT

if

you haven't already discovered that profitable extra margin of grinding ability and life in a . . .

METALITE®
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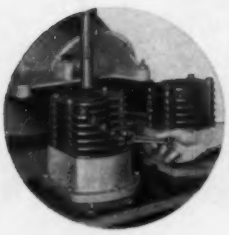
. . . an in-plant demonstration can cause you to revise your cost estimate . . . with a smile of pleasure. Just ask your Behr-Manning representative or write ..... Dept. AM-5, BEHR-MANNING CO., Troy, N. Y., a division of Norton Company.

BEAR BRAND
Abrasives

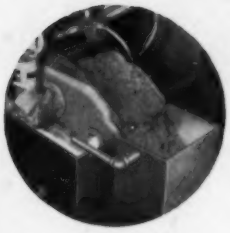
(Guard removed for photographic purposes only.)

QUALITY FOR YOUR PRODUCTS STARTS HERE



...WITH BARNESDRIL HONING MACHINES

Guarantee product quality through precision BarnesdriL Honing Machines. Greater ruggedness . . . a broader range of capacities . . . more compact design . . . easier maintenance — these are plus features inherent in every BarnesdriL machine to assure precision control at cost-cutting production rates. Our catalog 200 gives complete details. Write for your free copy!



...WITH BARNESDRIL FILTERS AND SEPARATORS

Control finish quality easily, more economically with BarnesdriL Filters, Separators, and Combination Filter-Separators. Designed to provide an abundant supply of clean, grit-free coolant, these automatic sludge removal units extend wheel life up to 50% . . . speed honing, gear-shaving and similar operations . . . cut coolant costs up to 300%. Send for catalogs 100-A and 300-D.

BARNESDRIL HONING MACHINES

Honing Machines/Production Units
Filtration Units/Drilling Machines

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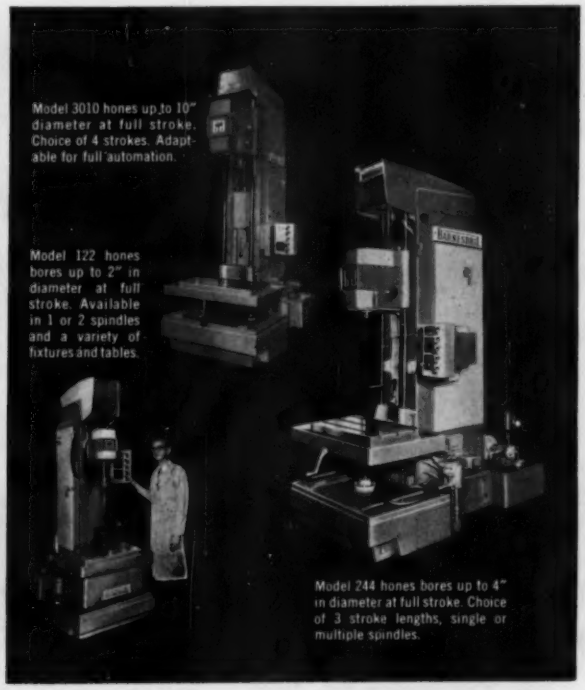
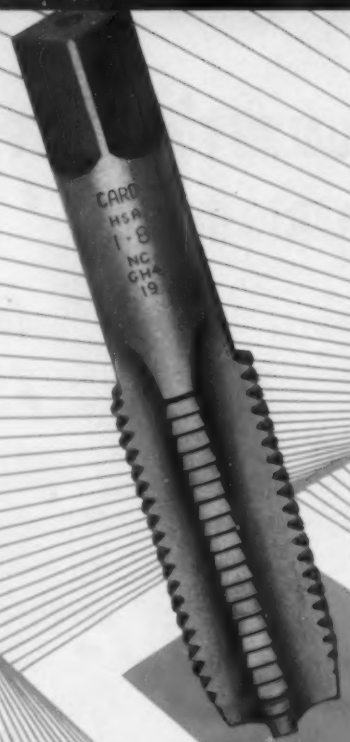
DETROIT OFFICE • 13121 PURITAN AVENUE

Model 4 Magnetic Separator, 40 GPM capacity.
Kleenall Combination Magnetic and Fabric Filter, Model MP-15.
Kleenall Fabric Filter, Model P-25.
Magnetic Separators arranged in Central System servicing 165 machines.


Model 3010 hones up to 10" diameter at full stroke. Choice of 4 strokes. Adaptable for full automation.
Model 122 hones bores up to 2" in diameter at full stroke. Available in 1 or 2 spindles and a variety of fixtures and tables.
Model 244 hones bores up to 4" in diameter at full stroke. Choice of 3 stroke lengths, single or multiple spindles.

◄ CIRCLE 271 READER SERVICE CARD

▲ CIRCLE 272 READER SERVICE CARD



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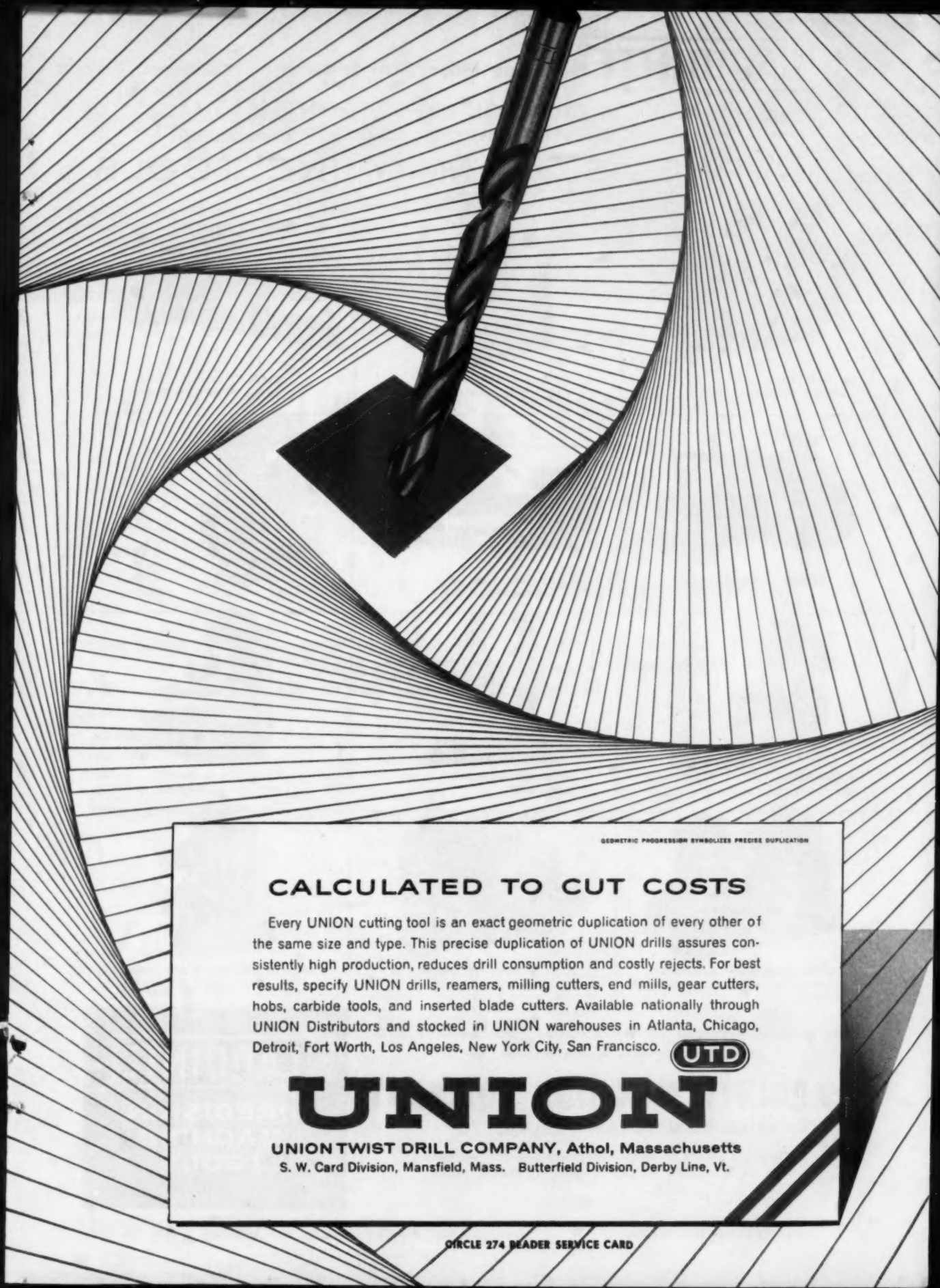
Every CARD tap is an exact geometric duplicate of every other CARD tap of the same size and type. This precise repetition keeps your production consistently high . . . and costs low. Your CARD Distributor can make fast deliveries of the exact types of tap, die, gage, or screw plate you need. Your CARD technical man has complete details on their use. S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York and San Francisco.

CARD

DIVISION OF UNION TWIST DRILL COMPANY

Serving you through the best distributors from coast to coast

CIRCLE 273 READER SERVICE CARD



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Every UNION cutting tool is an exact geometric duplication of every other of the same size and type. This precise duplication of UNION drills assures consistently high production, reduces drill consumption and costly rejects. For best results, specify UNION drills, reamers, milling cutters, end mills, gear cutters, hobs, carbide tools, and inserted blade cutters. Available nationally through UNION Distributors and stocked in UNION warehouses in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City, San Francisco.

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CIRCLE 274 READER SERVICE CARD

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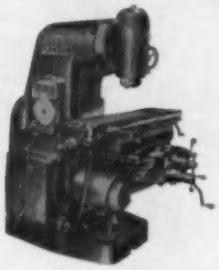
in operation . . . at the TOOL EXPOSITION '61

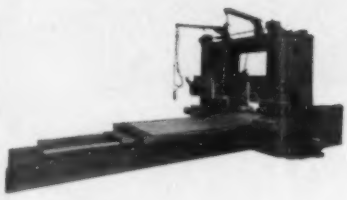
Space 1105, New York Coliseum, May 22-26, 1961

for these PRECISION MACHINE TOOLS

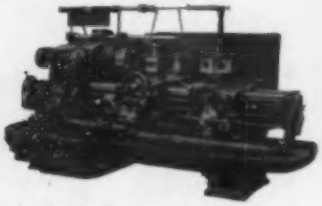
★ **CHURCHILL**
Grinding Machines



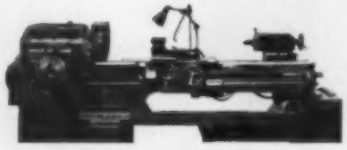
★ **PARKINSON**
Milling Machines, Gear Planers



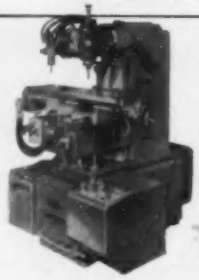
★ **BUTLER**
Planers, Shapers, Slotters



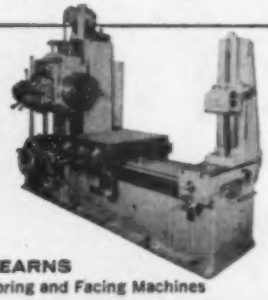
★ **WARD** Turret Lathes



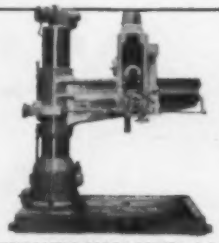
★ **LANG**
Engine Lathes



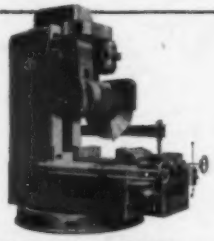
★ **HAYES**
Profile
Milling
Machines



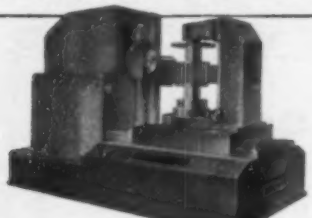
KEARNS
Boring and Facing Machines



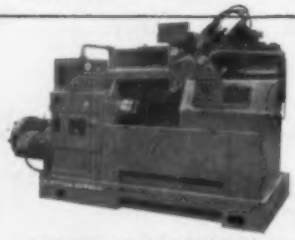
KITCHEN-WALKER, Ltd.
Radial Drills



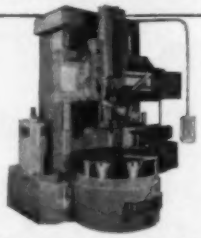
★ **CLIFTON & BAIRD**
Metal Sawing Machines



GEAR GRINDING COMPANY
Gear Grinding Machines and Measuring Equipment



CHURCHILL-REDMAN
Automatic Multi-Tool Profiling Lathes



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HUDSON, MASSACHUSETTS

Complete service on these machines is available through the facilities of the Lapointe plant in Hudson, Mass.

LAPOINTE

PRECISION MACHINE TOOLS

Ordinary hydraulic fluid made from mineral oil is ignited by open flame. Torch is 18 inches from nozzle orifice.

Shell Irus 902 Hydraulic Fluid, in the same test, refused to be ignited by 3000-degree flame.

BULLETIN:

3000-degree flame does not ignite Shell Irus 902—the fire-snuffing hydraulic fluid that helps make factories safe from fire

Shell forced Irus® 902 Hydraulic Fluid through a .145-inch orifice at 1000 psi pressure. The Irus Fluid was sprayed from the orifice and a 3000-degree flame thrust into the streaming fluid. Irus was not ignited.

Read the advantages of economical Shell Irus 902 and how it can protect your plant.

IRUS 902 is the fire-snuffing hydraulic fluid that protects lives and equipment.

How Irus works

Irus 902 is an ingenious combination of oil and water. The water is encased in a film of oil. In technical terms, it is a 100% water-in-oil emulsion.

But unlike other emulsions, Irus 902 has optimum stability. This is vitally important. It means that Irus Fluid will retain its lubricating qualities far longer than unstable oils—and will not allow the water to separate out. Result: the water stays in the oil, ready to snuff a fire if needed.

Other advantages

1. Cools off systems. Because of its high rate of heat transfer and high heat capacity, Irus 902 can allow hydraulic systems to run cooler.

2. Resists thickening and thinning. The viscosity of Irus 902 is tailored to protect pump parts during the entire working cycle—from cold start-up to hot, continuous operation.

3. Saves gaskets, packing, hose. Irus 902 is gentle to nonmetallic parts as well as metal. It can be used almost anywhere that you'd use mineral oil.

4. Resists foaming. Irus 902 does not hold captive air. If air is introduced, Irus 902 quickly releases it.

5. Easier to spot leaks. Irus 902 is bright yellow, helps you spot leaks quickly.

For complete details about changing over to Shell Irus 902, contact your nearest Shell Industrial Products Representative. Or write: Shell Oil Company, 50 West 50th Street, New York 20, N. Y.

A message to manufacturers of hydraulic equipment

Shell Irus 902 makes an excellent initial fill.

1. It is available anywhere in the U.S.A.

2. Quality of Irus Fluid is consistently high. It must meet strict Shell specifications.

SHELL

A BULLETIN FROM SHELL
—where 1,997 scientists are working to provide better products for industry.

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Schrader means quality ... in complete lines of double-acting and single-acting cylinders in a variety of sizes ... including JIC and miniature cylinders. Schrader Air Cylinders ... as well as complete lines of Valves and Accessories ... are at work on many OEM products and in thousands of plants performing countless jobs. Your Schrader Distributor is fully stocked ... staffed with experts to help you solve any air circuitry problem.

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MODEL E-2 AUTOMATIC FORM GRINDERS

The Jones & Lamson Model E-2 Automatic Form Grinder is specifically designed for precise, high production, plunge grinding on shaft work up to 31" in length. It is also adaptable for other types of between-centers work, as well as chucking work and jobs requiring external, shoe-type support.

These Important Features Provide PRECISION FORM GRINDING AT HIGH PRODUCTION RATES

COMPLETELY AUTOMATIC CYCLE . . . High-speed approach, variable wheel feed, spark out, and withdrawal are positively controlled through simple cam action. This ensures a constant and uniform machine cycle.

AUTOMATIC POSITIVE SIZE CONTROL . . . Wheel-slide held against positive stop with uniform hydraulic pressure.

AUTOMATIC TRUING DEVICE with CONTROLLED DRESSING . . . Once per piece, or once per predetermined number of pieces.

CRUSH WHEEL OR DIAMOND TRUING OR PERPETUAL FORM CONTROL (PFC — see center spread)

AUTOMATIC OR MANUAL HANDLING

COMPLETELY PACKAGED HEADSTOCK . . . Equipped with a constant speed A.C. motor. Work speeds range from 50 to 1500 R.P.M. Fast cycling (starting and stopping of the work spindle is done by means of an electric clutch and brake).

ADJUSTABLE WHEEL SPINDLE . . . Fast centerline adjustments for wheels varying from ⅜" to 2". Wheel flanges are also adjustable to accommodate wheel widths from ⅜" to 2".

DESIGNED FOR EASY MAINTENANCE . . . all hoods and guards are instantly removable. Internal machine components are readily accessible. For instance, the entire wheel-slide transmission can be taken out of the machine by simple removal of seven bolts.

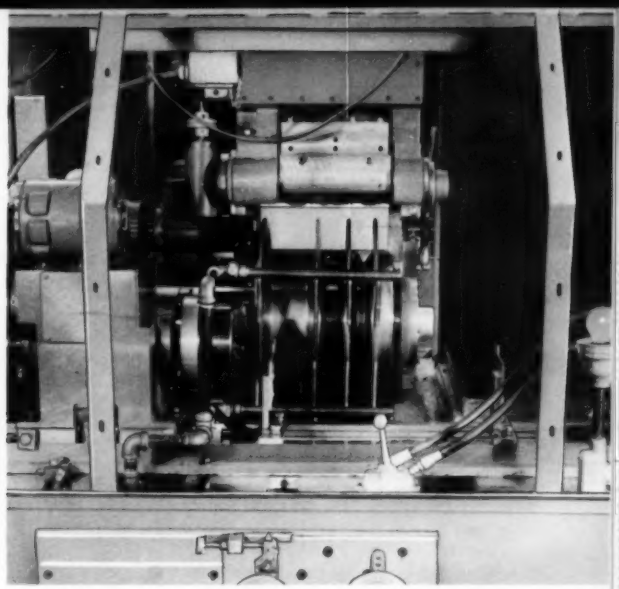
WHEEL-SLIDE HAS HARDENED AND GROUND WAYS . . . with three-point suspension system mounted on straight roller bearings.

EASY TO OPERATE . . . with features such as push-button control for automatic cycling, including automatic counter control for wheel truing.

All controls for operation and set up are located at the front of the machine. Free sliding doors to work area operate on roller bearings. There's plenty of room for loading and unloading—or for automatic handling.

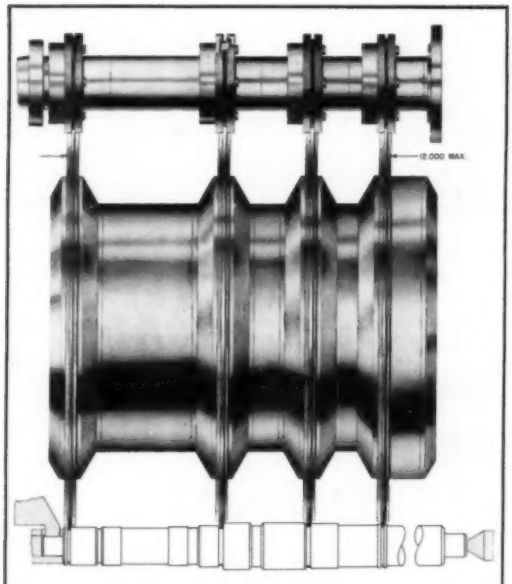
NEW

MODEL E-3 PROVIDES PERPETUAL FORM CONTROL FOR 12" WHEEL SPREAD



This new Model E-3 Form Grinder is specifically designed for precise, high production plunge grinding of widely spaced grooves.

Vertical design of the J & L Perpetual Form Control Truing Device, allows for a full 12" of wheel spread. Grooves up to 12" apart may be plunge-ground in a single pass.



FORM — 4 GROOVES
TIME OUT FOR DRESSING — 0
PRODUCTION — 125 PCS. PER HOUR

SPECIFICATIONS

J & L Model E-2 & E-3 Form Grinders

	MODEL E-2	MODEL E-3
Max. dia. of work ground with 20" dia. wheel	8"	8"
Headstock spindle-speed range	50-1500 R.P.M.	50-1500 R.P.M.
Max. dia. of swing over table	13"	13"
Max. length between centers	31"	31"
Platen — may be swiveled up to	15°	15°
Grinding wheel motor	5 to 25 H.P.	5 to 25 H.P.
Grinding wheel dia. 20" and hole size	10"	10"
Hand infeed per graduation	.0001" on dia.	.0001" on dia.
Max. spread of multiple-spaced grinding wheels	5"	12"

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J & L MODEL F AUTOMATIC THREAD GRINDING MACHINE

This machine is automatic in all of its functions. It will grind in both directions, or in one direction with automatic wheel withdrawal and rapid traverse. Pitch changes are accomplished through individual lead screws for each pitch, or hand of thread.

A wide range of work and wheel speeds are available. Work speeds range from 30 to 720 R.P.M. Rheostat control provides an infinite number of grinding wheel speeds between 1000 and 2600 R.P.M. This allows for quick selection of the most efficient speeds for all types of Vitrified and Resinoid Bonded grinding wheels.

Machine accuracy is guaranteed to grind threads within the following tolerances: pitch diameter to within .0005″ in regular production. Thread angle ±5′ on the half angle. Lead ±.0002″ per inch.

SPECIFICATIONS – Model F

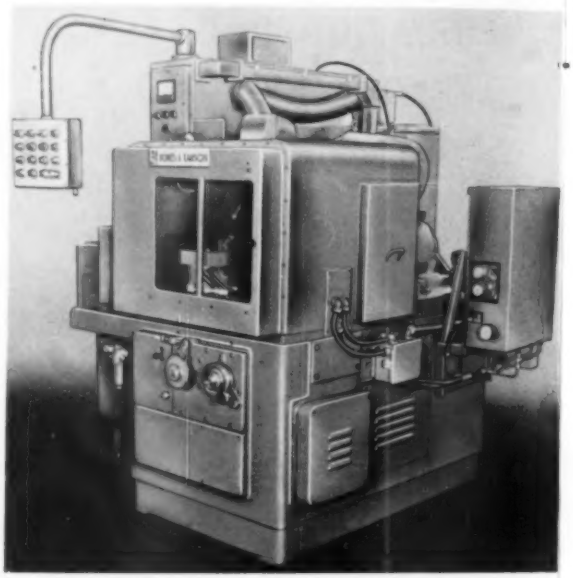
Max. thread dia.	¾″
Max. work length	6.900″
Max. dia. swing over table	10″
Max. thread length	3″
Number of cuts**	1-2-3-4
Standard work speeds*	24 – min. 30 R.P.M., max. 720 R.P.M.

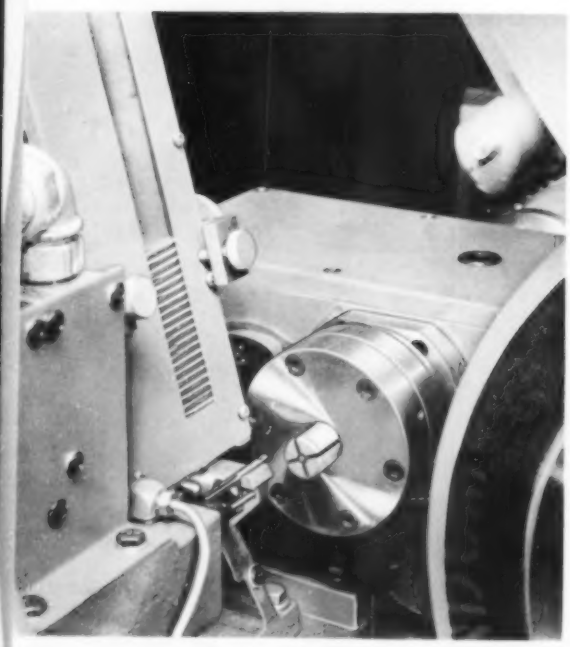
*On special applications, work speeds can be arranged to provide ranges as low as 8.6 to 136 R.P.M. These low speeds will accommodate work with diameters up to 1⅛″

**6-8 on two-way grind.

"CRISS-CROSS" GRINDING

Grinding time can be further reduced by 25%, when two-way grinding with two cuts. Here's how. Two wheel speeds and two work speeds can be provided automatically for each machining cycle. Work may be rough ground at a high wheel speed and a low work speed. Finish passes may then follow automatically with a lower wheel speed and at a work speed double that used for the roughing pass. This feature may also be applied when using one-way grinding.

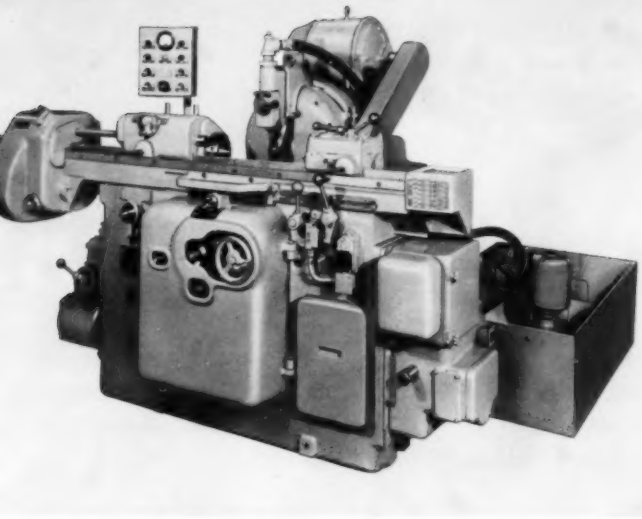




AUTOMATIC HANDLING On MODEL F AUTOMATIC THREAD GRINDER

Here is automatic handling as applied to the Model F in a tap grinding operation. Magazines for seven different sizes of taps ranging from #6 to ⅜″ are applied to the machine. The tap blanks are then fed to the grinding position, ground, and unloaded — automatically. A warning light, or horn, tells the operator when to change the empty magazine for a full one.

Production of up to 120 pieces per hour is possible.



6" x 36"

AUTOMATIC THREAD GRINDERS

6"x15"
6"x36"
12"x45"

MODEL TG-615. The 6" x 15" Automatic Thread Grinder is used for high-production thread grinding with multi-rib wheels, on relatively small, light work.

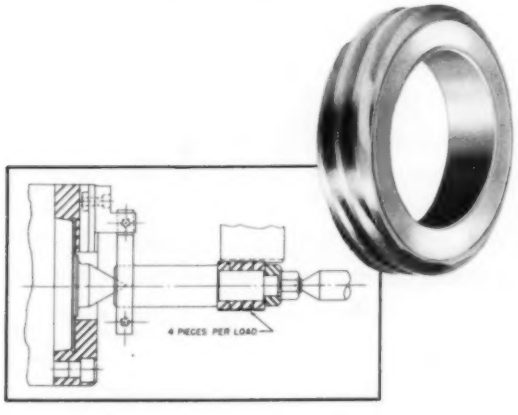
MODELS TG-636 and TG-1245. These machines are extremely versatile and are used on long or short-run jobs on taps, studs, gages, hobs, worms, spindles and a great variety of precision threaded parts. They are also used extensively for various kinds of form grinding. Single-rib, three-rib or multi-rib wheels can be used. They are fully automatic in the work cycle. Automatic dressing of the wheel, automatic sizing, automatic compensation for the amount dressed off the wheel, are some of the features that make these machines the finest of their kind for high precision thread grinding in the tool room or in the production line.

SPECIFICATIONS

	TG-615	TG-636		TG-1245	
	**	*	**	*	**
Max. thread dia.	6"	6½"	6½"	12"	12"
Max. thread length	2"	12"	2"	18"	2"
Max. work diameter	7½"	7½"	7½"	21"	21"
Max. work length	30"	36"	31"	45"	40"
Max. distance from end of thread to headstock center	14¾"	24"	19"	33"	28"

*Single-Rib Wheel.
**Full Multi-rib Wheel.

Any of these machines can be arranged for plunge grinding single or multiple grooves or contours. Multi-ribbed wheels, either diamond or crush dressed, are adaptable for all models.



SPEEDOMETER DRIVE GEARS

These four-start worms are ground, four at a time, in a single pass from the solid. A multi-ribbed wheel is crush-dressed every 48 pieces (twelve arbor loads). The finish on these parts and the rate of production exceed those possible by any other methods.

210 pieces per hour, floor-to-floor

SPECIFICATIONS

Diameter	1.93"
Pitch	Approx. 6
Form	Worm
Thread	4-Start
Lead	.6797"
Helix Angle	6° 37'
Thread Length	1⅛"
Stock removed	.089"

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Simultaneous Grinding a

This process is made possible by PFC (perpetual form control) truing devices manufactured by Jones & Lamson and CDP (cemented diamond particle cutters) produced by the Koebel Diamond Tool Company.

It provides continuous automatic control of accuracy for grinding wheels and grinding wheel action.

This revolutionary development permits you to grind many applications that otherwise would not be considered as economically sound for a grinding operation. It also allows one to materially improve upon a wide variety of operations performed by other machining methods or grinding approaches. For instance, automatic handling on grinding jobs becomes a much simpler and more economical process when there is no "time out — for wheel truing".

Depending upon the nature of the job, the wheel truing can be done, either intermittently, or continuously. The frequency of truing is controlled by an electric counter which is set to a predetermined number of pieces. This number is determined by the various specifications and complexities of the operations.

Even when using an intermittent truing cycle, the actual wheel truing occurs simultaneously with the grinding operation. Therefore, whether you are grinding and truing continuously or intermittently — no time is lost for conditioning the wheel.

Life of the CDP cutters is phenomenal. It frequently ranges over several months and hundreds of thousands of pieces ground — without changing the cutters. On one installation the original cutters are still in use after grinding over six million pieces. Also, the versatility of this process permits the best use of either Resinoid or Vitrified bond wheels.

Figures 1, 2 and 3 on the opposite page illustrate typical examples of groove grinding operations employing the PFC plunge form truing device with assemblies comprised of standard and special CDP cutters. Figure 4 shows a thread grinding operation using the PFC multiform truing device. In this case the cutter is controlled by a former as it is traversed across the wheel. Truing may occur simultaneously with the thread grinding operation providing more than one grinding pass is taken.

When equipped with the proper former, the PFC multi-form truing device may also be used for a wide variety of contours for form grinding applications. A single universal design cutter will accommodate a wide scope of threads and forms, or a specialized cutter may be provided for ultimate performance on long-run operations.

The multi-form technique is also adaptable for tolerance and finish requirements which are beyond the range of the plunge form method.

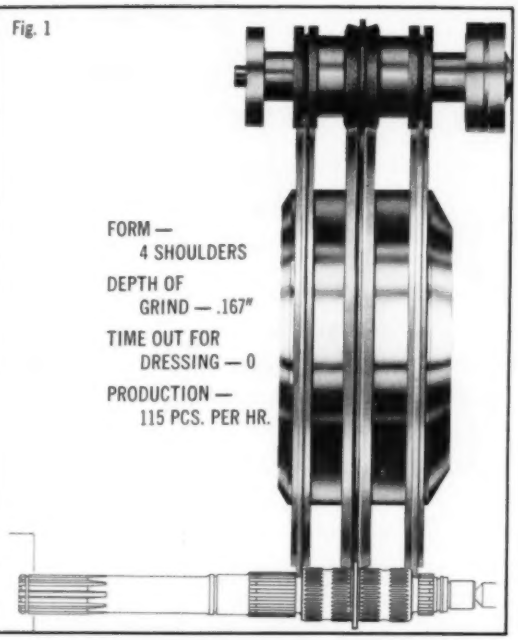
With any of the methods described, the amount trued off the wheel is automatically and accurately compensated for. Therefore, either manually operated or automated machines maintain part size to closer tolerances over a longer period of time than other methods where the dressing tool is more subject to wear. Due to negligible wear on the cutters over long operating periods, substantial savings are also made in inspection costs as only occasional spot checking is required.

Fig

Fig.

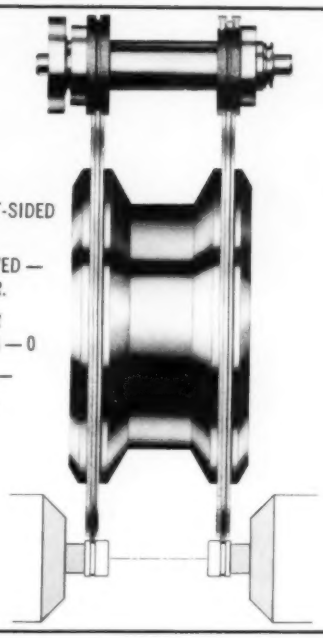
and Wheel Dressing

Fig. 1



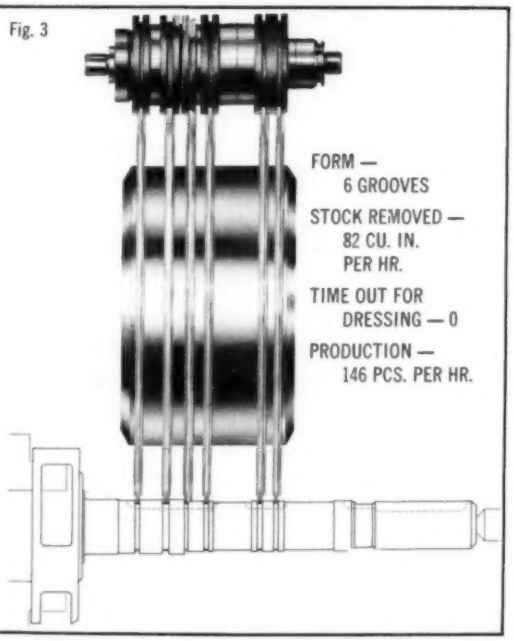
FORM —
4 SHOULDERS
DEPTH OF
GRIND — .167"
TIME OUT FOR
DRESSING — 0
PRODUCTION —
115 PCS. PER HR.

Fig. 2



FORM —
STRAIGHT-SIDED
GROOVE
STOCK REMOVED —
.040" ON R.
TIME OUT FOR
DRESSING — 0
PRODUCTION —
2,400 PCS.
PER HR.

Fig. 3



FORM —
6 GROOVES
STOCK REMOVED —
82 CU. IN.
PER HR.
TIME OUT FOR
DRESSING — 0
PRODUCTION —
146 PCS. PER HR.

Fig. 4

FORM — 60° THD.
8 T. P. I.
STOCK REMOVED —
.087" ON R.
TIME OUT FOR
DRESSING —
.04 MIN.
PRODUCTION —
31+ PCS. PER HR.

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NEW

MODEL 410 SEMI-AUTOMATIC THREAD GRINDER

High Precision
Compact Size
Low Priced

The J & L Model 410 is the first completely new thread grinding machine to be developed in many years. Here is a compact size thread grinder, priced accordingly, that provides *full size* capacity and exceptional accuracy.

ACCURACY is within ±5′ on the half angle; size control. 0005″ on pitch diameter; lead error ±.0002″ per inch. Here is how it's done:

High precision is designed for all sliding units using pre-loaded roll design for smooth accurate movements. Lead screw and infeed screw are precision ground. Direct line design of feed screw and stop for accurate size control. Precision work and wheel spindles are cartridge type, pre-loaded and lubricated for life. An inbuilt sine bar provides for long or short lead. A simple, accurate truing device dresses straight sided flanks from 5° to 45° and included angles of 10° to 90°.

COMPACTNESS The 50″ x 54″ floor space includes the machine, electrical panel, coolant tank & pump, plus storage for wheels & tools.

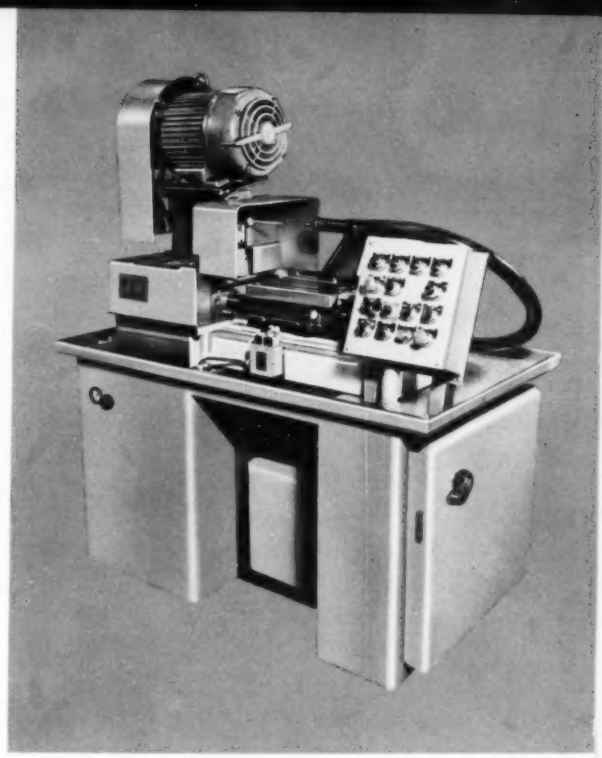
LOW PRICED For approximately $2.00 per hour for a 40 hour week, this machine can be leased on a 5 year J & L Profitivity Lease Plan. Includes: capacity for up to 4″ dia. work with 10″ of full thread length; variable speed work spindle; change gears and lead screw for 5 to 80 pitch threads; automatic truing device; all electric equipment — complete with motor and control panels; dresser infeed attachment; belts and pulleys; tailstock and headstock with centers; wheel adapters and two grinding wheels; plus a set of diamonds and driving dogs. This same machine can be purchased outright for under $11,000.

SPECIFICATIONS

Max. dia. of work	4″
Max. thread length	10″
Max. swing over table	4¾″
Work spindle speeds	2.5 to 120 R.P.M.
Grinding wheel speeds	2700 R.P.M
Max. helix angle	15°
Pitches available with standard set of change gears:	5, 6, 7, 8, 9, 10, 11, 11½, 12, 13, 14, 16, 18, 20, 24, 27, 28, 32, 36, 40, 44, 48, 56, 64, 72 and 80

NEW

PRECISION GUN DRILLING MACHINE FEATURES HIGH PRESSURE COOLANT DISTRIBUTION PLUS SPINDLE SPEEDS OF 15,500 RPM



Here for the first time is a machine which combines the major features necessary for successful gun drilling of very small holes. They are:

1. A *precision high speed spindle* capable of handling high pressure coolant flow.
2. *Accuracy* necessary to control size and straightness as well as excellent finish.
3. *Precise control* of constant, but *infinitely variable feed rates.*

The precision, pre-loaded ball bearing, cartridge-type spindle is specially designed to perform dual functions. It is arranged to handle standard shanks of all gun drills from ½″ dia. down to the smallest (.078″) at speeds up to 15,500 R.P.M. It is equipped with a rotary distributor for handling up to 12 gallons of coolant per minute and pressures up to 2,000 p.s.i. This combination of high speeds and coolant distribution at high pressure is a unique feature of the J & L Precision Gun Drilling Machine.

The machine bed is a rigid diamond-ribbed design, insulated from the base cabinet on a three-point mounting which dampens external vibrations.

The table is air-actuated with rapid traverse and feed controlled by a precision hydraulic check unit.

Performance will vary with material and conditions. However, when working with reasonable material, using proper gun drills in proper alignment, the machine is capable of producing parts to .0005″ in hole straightness up to 6″ in length. It will also hold diameter to .0002″ at a finish of 10 micro inches or better.

Penetration rates of 12″ per minute, or better, are not unusual.

SPECIFICATIONS

Max. length of hole	7½″
Stroke	7¾″ (max.)
Diameter of hole	max. ½″ — min. .078″
Variable or single speed drives for complete range of speeds	3500-15,500 R.P.M. 1750-7350 R.P.M. and 850-3675 R.P.M.
Feed rates	infinite
Floor space — without Coolant System	56″ x 34.5″
Floor Space — with Coolant System	56″ x 83.5″

If the J & L Grinding insert is missing, write JONES & LAMSON, 502 Clinton St., Springfield, Vermont, for your copy.

NEW MODEL 6 PRECISION BORING MACHINE

High precision . . . Compact size . . . Low priced

This extremely versatile new model is a highly accurate machine for precision boring, turning, and facing operations.

Accuracy is guaranteed to hold .0002″ tolerances on boring and turning operations (these machines are holding tolerances of .00005″ on some operations now being performed in the field).

Precision balance, rigidity, and infinite feed rates provide the basis for maintaining the best possible finish requirements.

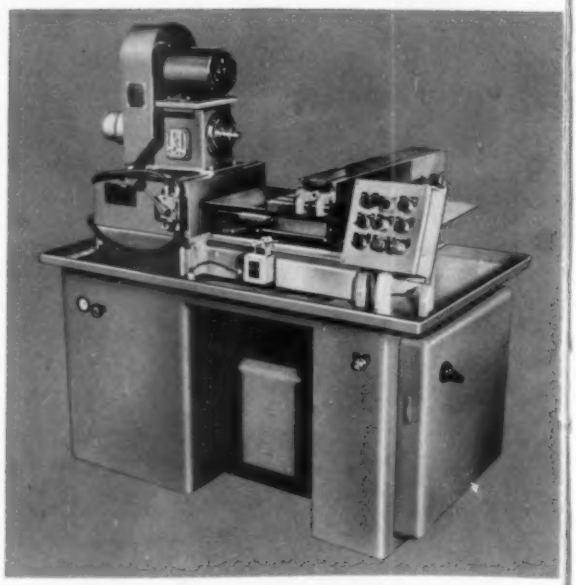
Various machine cycling combinations are available to the operator by merely setting a selector switch. These include: automatic table cycle, automatic table-and-cross-slide cycles, and completely manual operation.

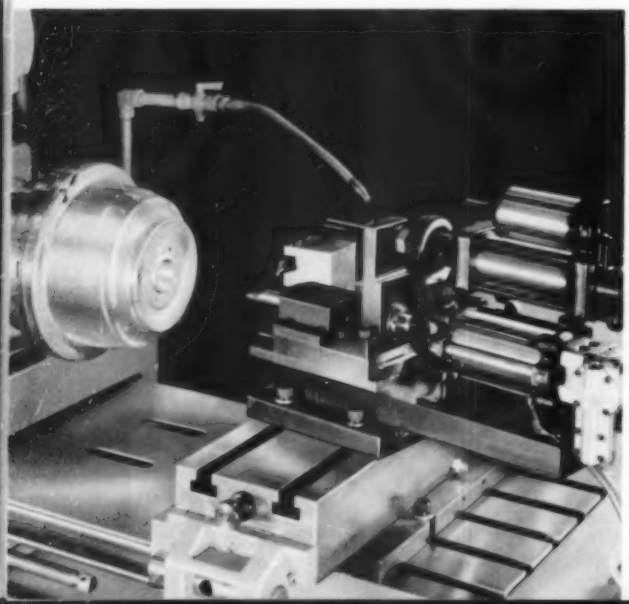
Set-ups are fast and simple All stops and feed adjustments are made from the front of the machine — without wrenches. Operation is even more simple. Just push one button.

Low priced For the wages of a part-time handy man, or about 95¢ an hour (figured at 160 working hours per month for 5 years) you can lease this precision machine with standard tooling arranged to handle most boring, turning and facing jobs with the capability of holding tolerances of .00005″. That's profitable precision for less than $1.00 per hour. Outright purchases make the investment even more attractive.

SPECIFICATIONS

Swing	10″ dia. (max.)
Stroke	7⅞″ (max.)
Bore	3″ dia. (max.)
Speed range	900-3280 R.P.M. or 1500-6000 R.P.M.
Floor space	56″ x 34.5″





Machine V-Belt Groove and Bore Tapered Hole in one operation

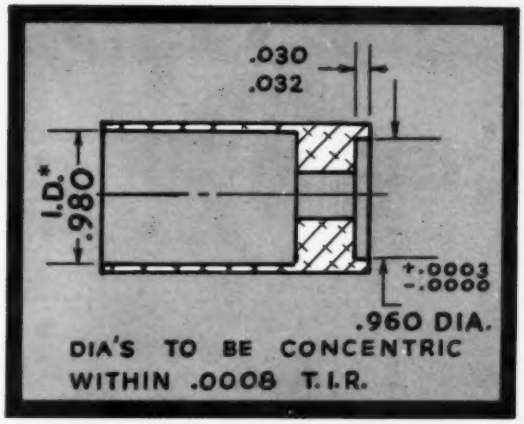
These pulley starter housings are gripped internally on an air operated chuck and located against a drive pin. The automatic cycle is as follows: the table moves to a stop position and the cross-slide feeds in to form a V-shaped groove. The cross-slide then backs out in rapid traverse and an auxiliary air hydraulic feed slide moves in to finish bore the hole on a taper. Feed rate for the grooving operation is .0005″ at 480 R.P.M. The boring operation is to .005″ at 480 R.P.M.

The Job:

Counterbore and hold concentricity on a high production part. Counterbore must be concentric with I.D. within .0008". (Material — aluminum alloy.)

The Solution:

Counterbore two pieces at once on double spindle machine. The table advances both tools to desired depth. The cross-slide then feeds toward the operator to face the bottom of both pieces. The work is held on the I.D.* with air operated collet arbors.

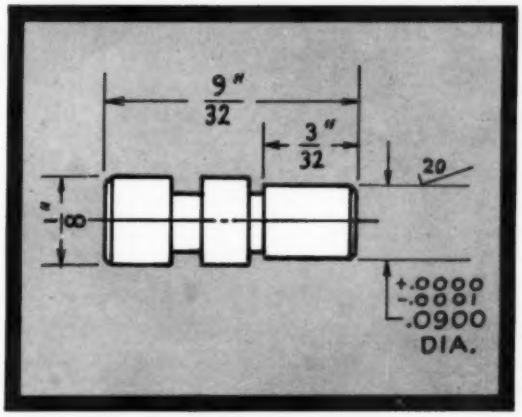


The Job:

Turn and chamfer parts too small for intended centerless grinding. (Material — Stainless SAE 30310.)

The Solution:

Hold in air-operated diaphragm chuck on ⅛" dia. Turn .090" dia. and cut chamfer at end of stroke. A single carbide tool was used on this high production job. The operator had only to load, push the automatic cycle button and unload.

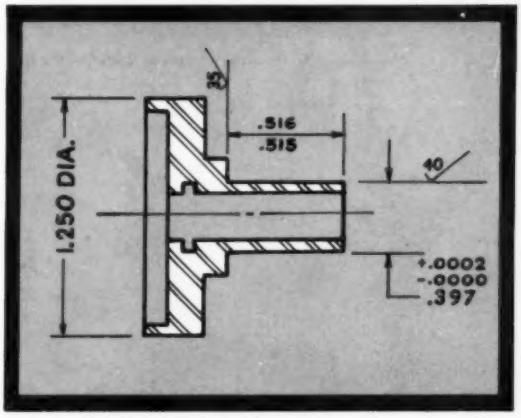


The Job:

Turn .397" dia., face end, and cut "O" ring groove. (Material — 303 stainless steel.)

The Solution:

Hold on 1.250" dia. in air operated chuck for turning and facing. Part is then reversed and held on .397" dia. for cutting "O" ring groove in second operation. Closed cycle feature assures fastest possible cycle as machine is in rapid motion except when cutting groove.



■ *Send financing and leasing information . . . plus . . . catalogs containing complete details on:*

- ☐ 6" x 15", 6" x 36", 12" x 45" Automatic Thread Grinders
- ☐ Model F Automatic Thread Grinders
- ☐ Model E-2 and E-3 Automatic Form Grinders
- ☐ Model 410 Thread Grinder
- ☐ Precision Boring Machine
- ☐ Precision Gun Drilling Machine

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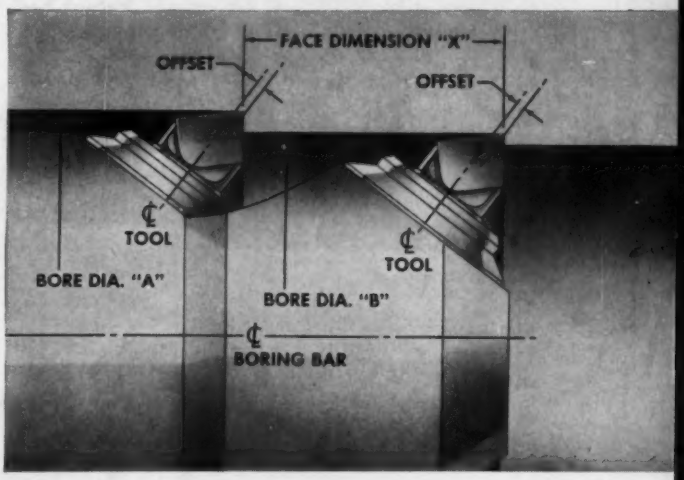
GRINDING · BORING & GUN DRILLING

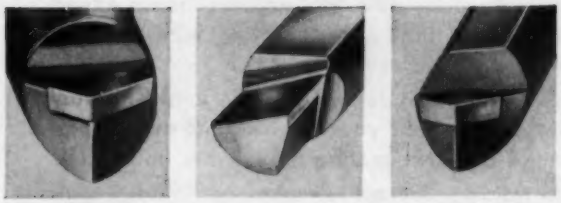
JONES & LAMSON MACHINE COMPANY

special report from Fair Street on cutting tool geometry

ONE OF A SERIES

the need for proper offset control





WHAT TOOL POINT OFFSET IS

Tool point, or nose radius offset, is the distance from the center line of the tool to the center line of the nose radius. Tool point offset is a direct function of the size of the nose radius, the tool mounting angle and the required location of the tool point. Tool point offset is varied to accommodate job requirements.

WHERE TOOL POINT OFFSET IS IMPORTANT

Whenever it is necessary to hold more than one dimension with single point cutting tools, accurate control of tool point offset is a must. If this often neglected, but all-important offset dimension is not accurately controlled, much unwanted machine down time can result. By referring to the chart it can be noted that the offset dimension (tool point offset) must be accurately controlled if part piece dimensions including diameters and face-to-face relationships are to be maintained. Also, this offset must be located in a precise relationship to cutting edge angles and nose radius.

IMPORTANCE OF OFFSET IN A PRE-SETTING PROGRAM

A proper pre-setting tooling program is one in which well designed tool bits are removed from tool holders, re-sharpened and placed in tool storage. Then these bits are pre-set to size and re-mounted in tool holders as needed. It is thus possible to maintain and replace tooling for cluster or single tool holders with a minimum of machine down time. However, without proper control of tool point offset and other elements of tool geometry, pre-set programs cannot and will not work.

IMPORTANCE OF THE DEVLIEG MICROPOINT TOOL GRINDER FOR MAINTENANCE OF OFFSET DIMENSIONS

The DeVlieg MICROPOINT Tool Grinder has separate direct reading dials for all variables governing single point tool geometry including the often critical offset dimension. Therefore, it is possible to grind tools on a MICROPOINT Grinder and to generate a tool with geometrically perfect relationship between tool point offset, nose radius and cutting edge angles.

For further information about the DeVlieg MICROPOINT Tool Grinder, please write or visit DeVlieg Machine Co., Fair Street, Royal Oak, Mich.

DeVlieg

MICROPOINT® TOOL GRINDER

for grinding all sizes and types of round and square shanked tools

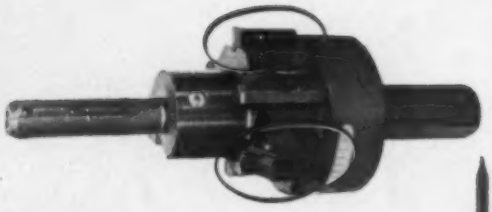
◄ CIRCLE 279 READER SERVICE CARD

CIRCLE 280 READER SERVICE CARD

WHICH WAY TO BORE . . .

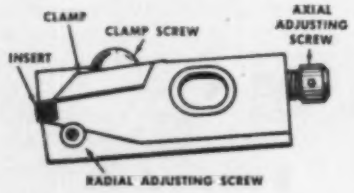
REGRINDABLES or

guaranteed performance makes it easier to decide . . .



Wesson Development Simplifies Tooling and Reduces Inventory Needs

Only 5 basic cartridges (18 options for rake angle and opposite hand) are required to assemble an unlimited variety of single or combination boring, turning and milling tools. Using throw-away inserts and incorporating both radial and axial adjustment, the cartridge fits in a keyway in the bar body or tool block.



Exclusive advantages not possible with any other form of tooling include:

Minimum Holder-Parts-Insert Inventory
Unlimited Application Flexibility
Lowest Tool Cost; No Grinding
Precision Adjustment

For complete details ask your Wesson man or write for Bulletin C-660.

When Wesson recommends tools for your job, they are guaranteed to perform as specified regardless of whichever type tool is best for your application (Wesson makes both regrindables and throw-aways). This performance guarantee is possible because:

1) **Your local Wesson field engineer is an expert in boring, turning and milling with carbides (see examples at right).**
2) **He is prepared to make a thorough, In-Plant Job Analysis of your applications and recommend the best tooling to suit the conditions.**
3) **He follows through to make sure that the tools are installed properly, used properly and perform properly.**
4) **Behind every field man is the extensive experience and facilities of Wesson's 4 specialized tool plants, basic research, application research and tool engineering groups and Wesson's own carbide metals plant.**

A Wesson In-Plant Job Analysis—at no cost to you—enables us to make a sound recommendation based on all the facts. Call your Wesson man in—if he can improve your operations he'll give you a detailed description of how—if he can't improve them . . . he'll tell you that too!

In any case, call him now and ask for your copy of the new 8-page booklet, "How to Bore with Regrindables or Throw-Aways". (Or write us, if you prefer.) This booklet can be of considerable help in planning boring operations.

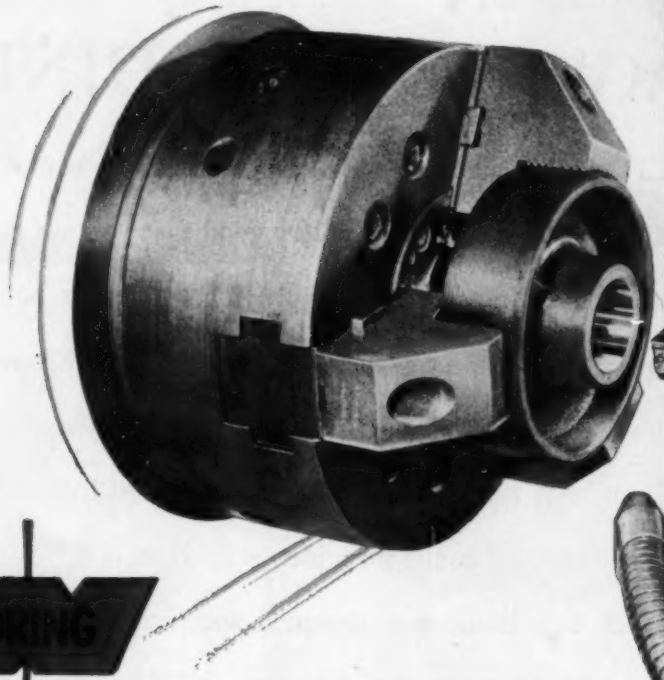
Wesson Company, 1220 Woodward Heights Blvd., Ferndale 20, Michigan. In Canada: Wesson Cutting Tools Ltd., 93 Judge Road, Toronto 18, Ontario.

WESSON

WESSON COMPANY ● ARCHER & SMITH ● WESSON RESEARCH ● WESSON METAL CORP. ● WESSON MULTICUT CO. ●

CIRCLE 281 READER SERVICE CARD

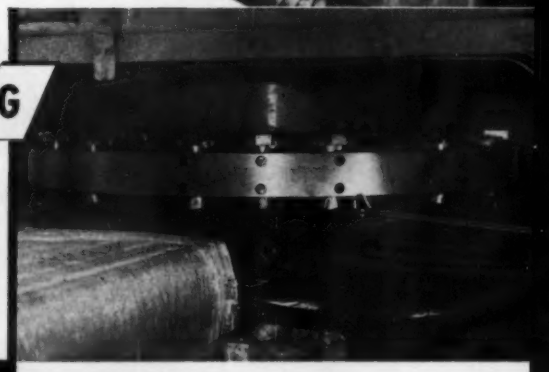
THROW-AWAYS?



BORING

After failure of all other boring tools tested, this company asked the Wesson field engineer for a job-analysis study. Result: a standard Wesson PAS (positive-rake) boring bar with Wessonmetal WH inserts now bores these hubs at a rate of 160 pieces per insert.

MILLING



Tool life extended from 8-hours to 12-weeks and tool adjustment time reduced from 2-hours to a few minutes . . . that's the Wesson record on this scalping mill. Wessonmetal GI inserts (in locator-anvil units) are micro-adjustable to permit quick setting of face runout.

TURNING

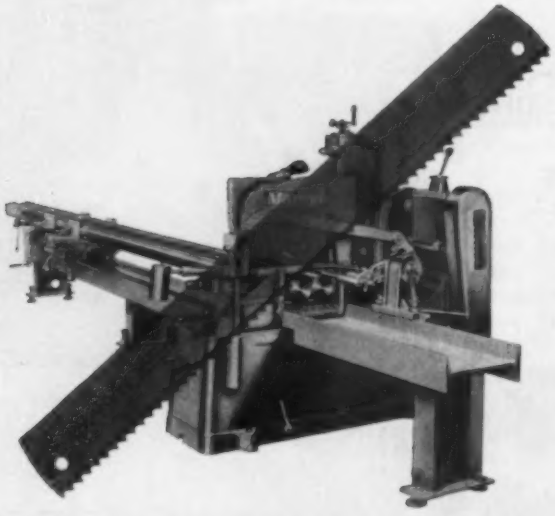
Severely interrupted cuts can impose excessive tool shock loads. A Wesson In-Plant Job-Analysis recommended multiple tools—with successive tools taking identical cuts. Two tool blocks—each with five throw-away insert holders—now turn out 450 pieces per set of inserts.

● WESSON CUTTING TOOLS LTD.

CIRCLE 282 READER SERVICE CARD

a message to owners of
MARVEL HACK SAW MACHINES

If you are the owner of a MARVEL Hack Saw Machine, check the name on the blades being used in it. If they are not MARVEL Blades, the chances are very good that you are not getting all the cutting-off speed, accuracy, and economy you paid for when you bought a MARVEL Saw. Consider this fact. The hack saw *blade* is the cutting tool that actually does the cutting job. If the machine is expected to deliver its full efficiency, the blade must possess a ruggedness comparable to that of the machine. Isn't it logical, then, that the blades you use be as carefully selected as the machine itself? Here is another fact: The MARVEL High-Speed-Edge Hack Saw Blade was designed specifically to withstand the heavy feed pressures and high cutting speeds your MARVEL Hack Saw can deliver. Only MARVEL UNBREAKABLE Hack Saw Blades can be safely tensioned taut enough to provide the maximum rigidity of the cutting tool necessary for accurate cutting-off; and at the same time, protect both the operator from injury and the machine from damage that so frequently occurs with "breakable" blades.



Why not be certain your MARVEL saw is delivering the high performance you had originally purchased, by using the only blade capable of utilizing the power and accuracy built into the machine? MARVEL Hack Saw Machines and MARVEL High-Speed-Edge Blades are an unbeatable combination. MARVEL High-Speed-Edge Hack Saw Blades are stocked and sold by leading Industrial Distributors everywhere.

ARMSTRONG-BLUM MFG. CO.
5700 Bloomingdale Avenue • Chicago, Illinois

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

IMMEDIATE DELIVERY

STYLE 28-A
HYDRAULIC POWER UNIT

STYLE 22
HYDRAULIC POWER UNIT

STYLE 20
HYDRAULIC POWER UNIT

STYLE 502
LEAD SCREW TAPPING UNIT

Ex-Cell-O Hydraulic Power Units in Stock Now to Cut Your Machine Tool Lead Time and Production Costs!

Reduce lead time, increase productivity, and cut per-unit cost with Ex-Cell-O Quill-Type Hydraulic Power Units—immediately available for drilling, counterboring, spot-facing, and reaming operations, or as prime movers for milling equipment.

Ex-Cell-O Hydraulic Power Units are self-lubricated . . . built for easy installation, and trouble-free operation, even under fast cycles and continuous production. Compactness allows close center distance installation, in-line or radial . . . versatility makes them ideally suited for special-purpose, high production machines. A companion product, the Style 502 Tapping Unit, uses a lead screw for trouble-free tapping.

See your Ex-Cell-O representative or write direct for full information on the complete line of Hydraulic Power Units and our Canadian-built Lead Screw Tapping Unit.

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Machinery Division

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

60-42

Introducing DEX A MILL

...THE NEW INDEXABLE MILLING CUTTER BY ADAMAS THAT GIVES YOU:

- **GREATER ACCURACY to produce finer finishes**
- **MORE TEETH to remove more metal**
- **SUPERIOR DESIGN to give longer carbide life**

POSITIVE LOCK

Adamas Dex-A-Mill features the powerful combination of positive lock on top and carbide anvil under carbide insert. Securely locks, easily unlocks with a partial turn of a wrench.

CARBIDE CHIP DEFLECTOR

Protects cutter body from chip erosion—Chips strike long-wearing carbide deflector instead of body or locking mechanism.

THICK CARBIDE ANVIL

For maximum rigidity and insert support . . . permits higher feeds and speeds . . . protects cutter body from damage.

THROWAWAY CARBIDE INSERTS

Inserts are quickly and accurately indexed or replaced on the machine with the cutter in position. Eight individual cutting edges on each insert eliminate costly regrinding.

WIDE, DEEP CHIP SPACE

Allows maximum metal removal—permits heavier cuts . . . Eliminates possible damage to cutter due to loading of chips.

Greater accuracy is built-into the rugged, heat-treated alloy steel body of this top performing milling cutter for throwaway inserts. Its 2-piece construction enables insert seats to be uniformly ground to extremely close tolerances assuring consistently superior performance. DEX-A-MILL's greater number of teeth per cutter diameter permit fast, low-cost milling operations with inexpensive, indexable, throwaway carbide inserts. Right and left hand cutters are stocked in both shell end mill and face mill designs with double negative rake angles and 15° lead angle. Standard size diameters range from 3" to 12" . . . Special cutters subject to quotation.

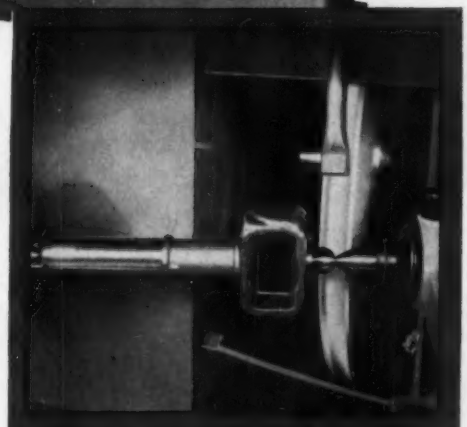
● *For full details, write for your copy of Bulletin DM-860.*

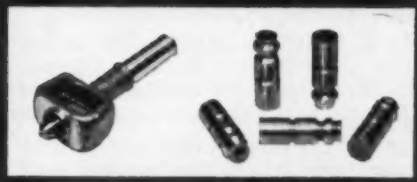
Producers of:
Tungsten Carbide Tools
Tool Tips
Dies, Wear Parts
Dex-A-Tool
Dex-A-Mill

ADAMAS CARBIDE CORPORATION
KENILWORTH, NEW JERSEY

PROGRESSIVE CARBIDE USERS SELECT BY *Performance*...NOT HABIT!

NOW—An Automatic Form and Groove Grinder . . . designed for tomorrow's production requirements!





WORKPIECES—Standard Ex-Cell-O Model 973 takes parts up to 24″ long. Can be equipped for parts with 36″ centers. Workhead adjustable for angular settings.

OPERATIONS—Precision-built for rough, semifinished or finished production grinding.

CONTOURS—Grinds straight, angular and radius grooves, and a variety of forms. Grinds multiple grooves when fitted with two or more wheels.

CYCLING—Fully automatic cycling, including opening and closing hood. Rapid wheel slide advance and return for maximum productivity.

SIZE CONTROL—Automatic wheel dressing after each cycle or any number of cycles. Automatic wheel size compensation after each dressing. (Handwheel graduated to .0002″ for manual setting.)

DRESSERS—Designed for use with all standard Ex-Cell-O Diamond Dressers, or any special rotary diamond-set wheel dressers.

ACCESSORIES—Model 973 is a complete, versatile machine with extensive automatic features. However, it is designed to be easily equipped with automatic work loading and unloading devices, air operated chuck and tailstock and other accessories to meet your special requirements.

DATA AVAILABLE—Contact your local Ex-Cell-O Representative, or write direct for descriptive literature and engineering data.

61—25M

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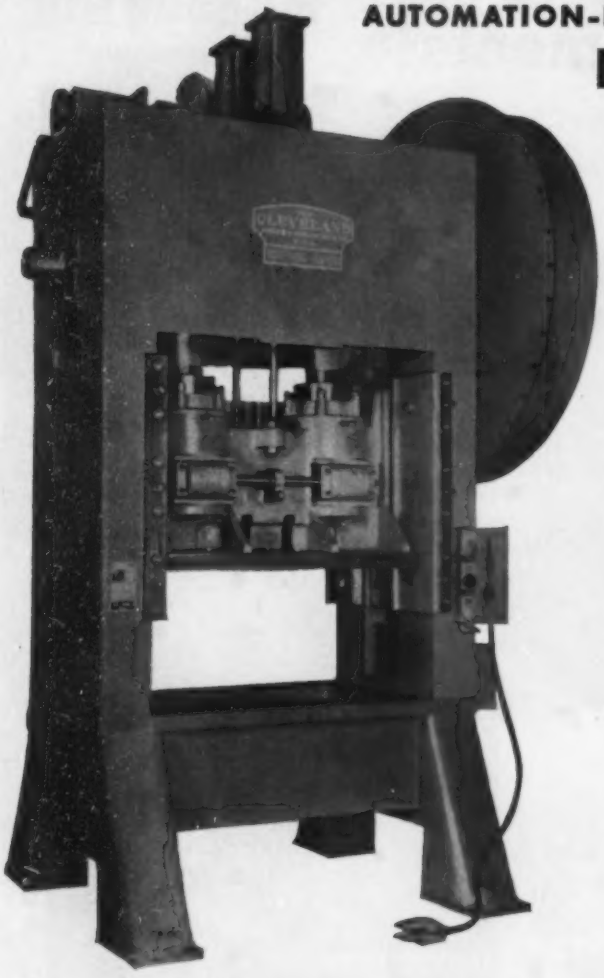
Machinery Division

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

CLEVELAND

AUTOMATION-DESIGNED • COST-CUTTING DOUBLE CRANK PRESSES



Continuous, uninterrupted production is the "profit plus" this new Cleveland Double Crank Press is achieving at the Walker Manufacturing Company in Jackson, Michigan. This multi-station, automated Cleveland Press on each stroke pierces, extrudes and forms muffler heads at the rate of 45 strokes per minute (adjustable to 55 s.p.m.). This 150-ton press has a 48" x 36" bed and slide area, 8" stroke of slide with 6" adjustment, electrically controlled air-operated Cleveland (patented) Drum Type Clutch with spring loaded brake, auxiliary air brake on flywheel, and completely enclosed gears running in oil.

Let's talk MONEY—the money you save when you have a modern, cost-cutting Cleveland Press on your production line.

First there is *Production Money*—the money you make more of due to Cleveland's versatile, dependable performance.

Next there is *Downtime Money*—the money you need never worry about with a modern Cleveland Press—ruggedly built, designed for uninterrupted production—the press that pays its way by doing its job day after day.

Then there's *Profit Money*—the money that's extra for you on every production run because your Cleveland Press is precision-built with such secure and precise stroke action that dies last longer, delicate punches can be used with minimum breakage, and your production quality is topgrade, scrap-free.

When you buy a CLEVELAND PRESS, the *cost-cutting money* you save plus the *profit money* it earns for you far surpasses the cost of replacing that old press with a modern, quality-built Cleveland Press. That's why it will pay you to look into the advantages Cleveland Presses offer.

Write Today for Double Crank Press Catalog SD2-60

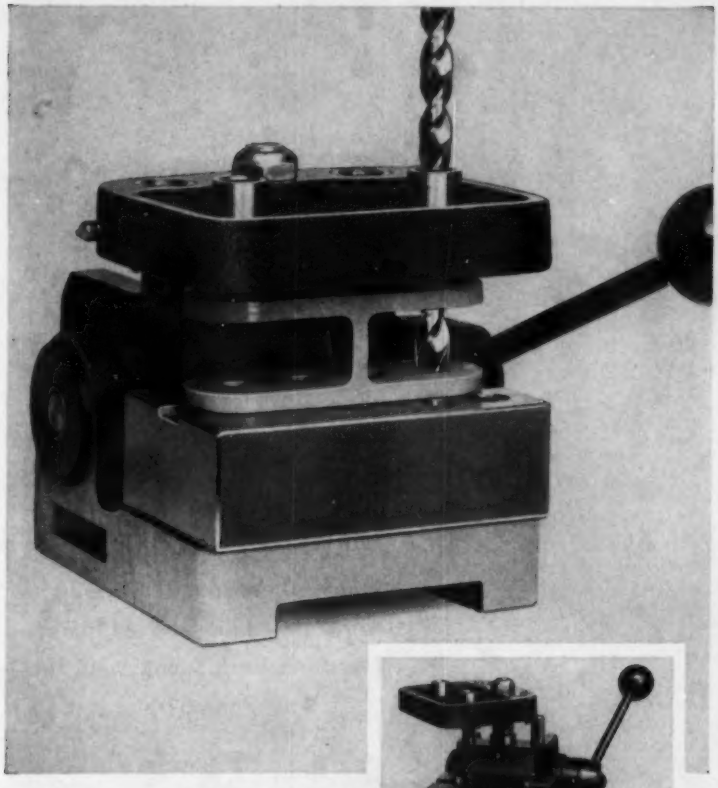
A-2189A

THE CLEVELAND PUNCH & SHEAR WORKS CO.
Established 1880

Power Presses
Fabricating Tools
Punching Tools & Dies

E. 40th and St. Clair Avenue, Cleveland 14, Ohio

Another production time-saver from Ex-Cell-O . . .



LIFT-SWING: the answer to tough drilling jobs!

Available in a range of sizes for short-run and volume drilling, reaming and tapping, Ex-Cell-O's new Lift-Swing Drilling Fixture loads and unloads in seconds, and is precision-machined for 90° "tumble-jig" setups.

Patented "swing-away" top plates swivel for access to the part, and permit a variety of easily tooled jobs; double top plates let you drill stepped holes, or adjacent holes with minimum wall thickness, regardless of bushing wall size.

Your local Ex-Cell-O Representative or Distributor will gladly show you how low-cost Lift-Swing Drilling Fixtures save tooling time and fixture costs, or contact Ex-Cell-O direct for details: Phone TOwnsend 8-3900; TWX—DE 876; Wire ZTC.

COMPONENTS FOR ALL YOUR JIG AND FIXTURE NEEDS— AVAILABLE IMMEDIATELY FROM A SINGLE, RELIABLE SOURCE!

Micron Sections— Machined cast-iron shapes cut to order.

Drill Jig Bushings— Carbide or steel for metal and plastic jigs.

Fixture Components— Clamp assemblies and fixture details.

Reader Service Card Number is for Lift Swing literature only. Request literature on above items separately.

61-50 BU

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PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • JIG AND FIXTURE COMPONENTS • TORQUE ACTUATORS • CONTOUR PROJECTORS GAGES AND GAGING EQUIPMENT • GRANITE SURFACE PLATES • COMPUTER PRODUCTS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • ATOMIC ENERGY EQUIPMENT • DAIRY AND OTHER PACKAGING EQUIPMENT

Bushing Sales Division

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

Cleco's All New Direct Drive No. 1600 Vertical Grinder/Sander.

and still another

PRODUCTION LINE HELPMATE

from

CLECO AIR TOOLS

This direct drive—governor controlled, vertical grinder/sander is a production booster. It maintains a safe high speed with medium-heavy work loads (where most of your grinding is rated). Cleco's No. 1600 Grinder has a high-strength, heat-treated aluminum casing and a built-for-safety, heavy spring governor. Its casing is constructed in one-piece, giving you a light weight tool that can take the bumping and dropping you know it will receive. This feature plus the tool's inherent low maintenance features will endear the No. 1600 Grinder to every maintenance department.

OTHER IMPROVEMENTS INCLUDE: A choice of throttle arrangements . . . 1) Butterfly on-and-off safety throttle; 2) Butterfly on-and-off with throttle detention; 3) Standard lever throttle. A dead handle that can be positioned from 90° to 120° from throttle handle, or it may be removed entirely for close work. A remarkably safe, stainless steel governor that can be custom-set to your air pressure.

CLECO'S No. 1600 Grinder/Sander weighs only 7½ lbs., is 7 ins. high, and utilizes a 6 in. cupwheel. Available in three speeds: 4500, 6000, and 8000 r.p.m. FOR A DEMONSTRATION-TRYOUT, CALL YOUR LOCAL CLECO® REPRESENTATIVE. FOR DESCRIPTIVE LITERATURE, WRITE:

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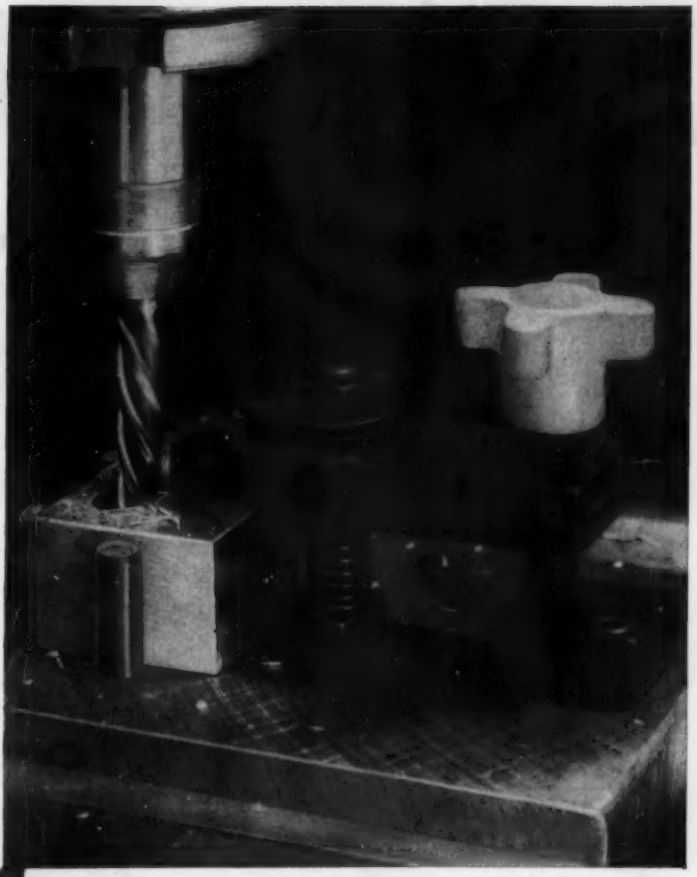
P. O. BOX 2541 • HOUSTON 1, TEXAS
IN CANADA: Cleco Pneumatic Tool Company of Canada, Ltd.
927 Millwood Road, Leaside (Toronto), Ontario

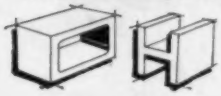
"quality tools engineered for industrial progress"

NOW A Complete line of Jig & Fixture time-savers!

Ex-Cell-O Precision Clamp Assemblies and Standard Details for Fast, Economical Fabrication of Jigs and Fixtures

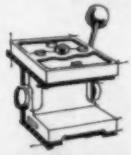


COMPONENTS FOR ALL YOUR JIG & FIXTURE NEEDS — AVAILABLE IMMEDIATELY FROM A SINGLE, RELIABLE SOURCE!



Micron Sections Machined cast-iron shapes cut to order.

Drill Jig Bushings Carbide or steel for metal and plastic jigs.



Lift-Swing Fixtures For fast drilling of difficult holes.

Reader service card number is for Fixture Components only; please request literature on other items separately.

Ex-Cell-O's new line of clamp assemblies, fixture details, spring plungers, torque screws and other fixture components gives you an unusually wide range of standard clamps and details in sizes and types to suit virtually every fixture-building need.

The complete cataloged line—from clamps and locks to plungers, locating buttons, handwheels and torque screws—is available from your local Ex-Cell-O Representative or Distributor, or direct from Ex-Cell-O. Phone TOwnsend 8-3900; TWX-DE 876; Wire ZTC.

BUYER'S GUIDE and PRICE LIST—Ex-Cell-O's new Fixture Component Catalog lists hundreds of parts and assemblies, specifications and prices. No cost or obligation. Send for it today!

61-208U

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PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • JIG AND FIXTURE COMPONENTS • TORQUE ACTUATORS • CONTOUR PROJECTORS GAGES AND GAGING EQUIPMENT • GRANITE SURFACE PLATES • COMPUTER PRODUCTS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • ATOMIC ENERGY EQUIPMENT • DAIRY AND OTHER PACKAGING EQUIPMENT

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A Correct Tool for Every Lathe Operation

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ARMSTRONG Tool Holders are long-lasting tools. They are strong beyond need, handy and efficient, profitable to use, and are readily available from your local ARMSTRONG Distributor.

Check over your ARMSTRONG Tool Holder needs. Write for literature.

If you do not know the name of your local ARMSTRONG Distributor, inquire when asking for literature.

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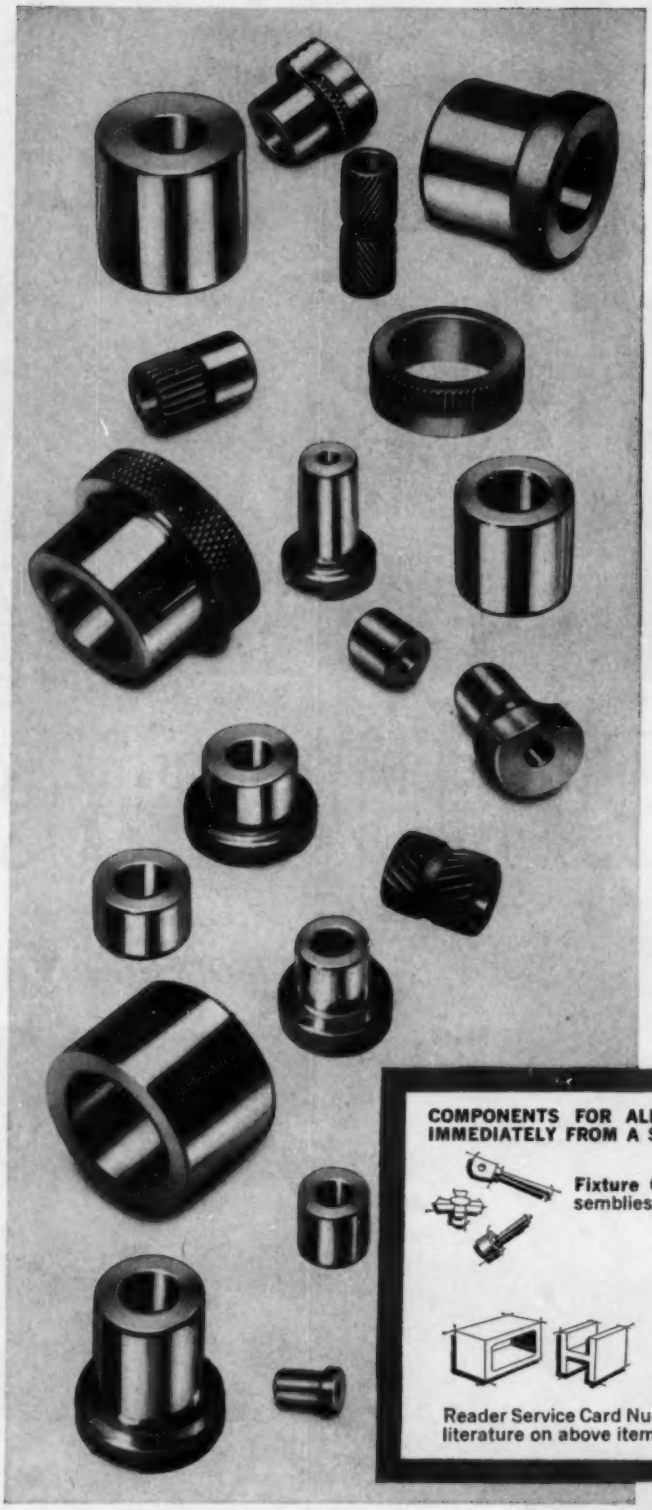
ARMSTRONG BROS. TOOL CO. 5215 W. ARMSTRONG AVE. CHICAGO 46, ILL.



Ex-Cell-O Drill Jig Bushings

Uniform Hardness, Uniform Quality in More Than 11,000 Cataloged Bushings for metal or plastic jigs!

In stock now from coast to coast, Ex-Cell-O Drill Jig Bushings are made from the finest chrome-alloy bearing steel, precision-ground inside, outside and under the head. Steel bushings are held to consistent 62-64 Rockwell C Hole hardness.

Ex-Cell-O carbide bushings are made from the finest material available.

Select from one of the largest inventories in the U. S.

FREE DATA—See your local Ex-Cell-O Representative or Distributor for catalogs and bulletins on Drill Jig Bushings and other jig and fixture cost-cutters. Or contact Ex-Cell-O direct: Phone TOwnsend 8-3900; TWX—DE 876; Wire ZTC.

COMPONENTS FOR ALL YOUR JIG AND FIXTURE NEEDS—AVAILABLE IMMEDIATELY FROM A SINGLE, RELIABLE SOURCE!

Fixture Components—Clamp assemblies and fixture details.

Lift-Swing Fixtures—For fast drilling of difficult holes.

Micron Sections—Cast-iron shapes precut to your needs.

Reader Service Card Number is for Drill Jig Bushing Literature only. Request literature on above items separately.

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Bushing Sales Division

EX-CELL-O CORPORATION

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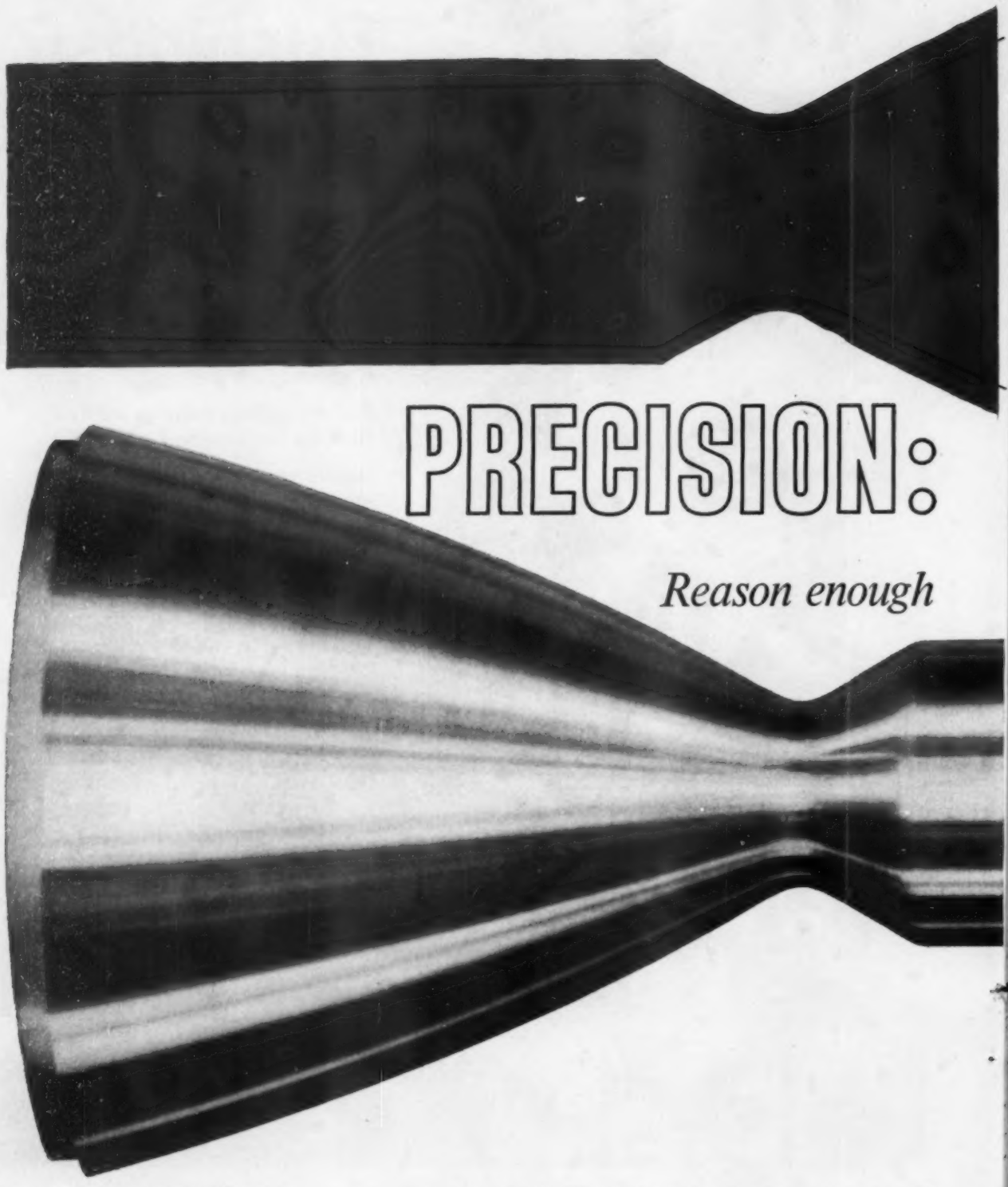


PRECISION:

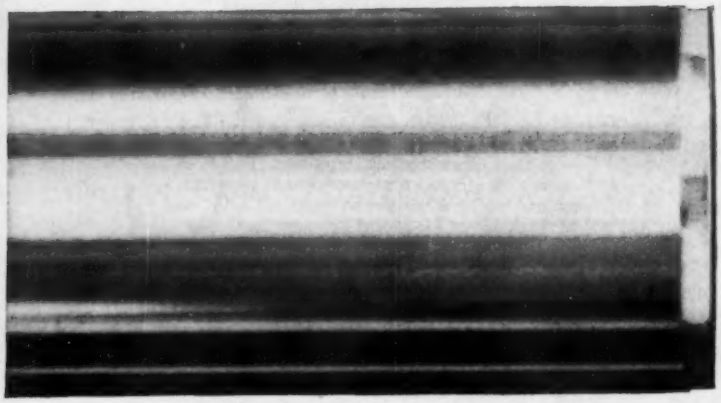
Reason enough

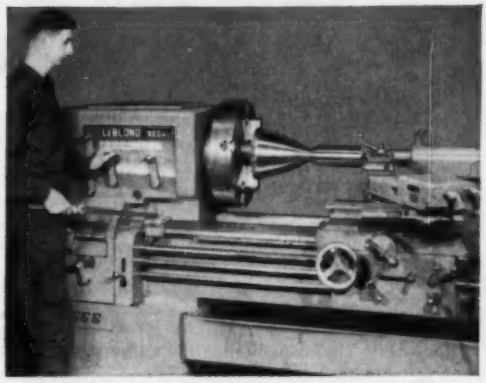
to buy LeBlond

In Hartford, Conn., Delta Corp., specialist in precision fabricating and machining for the aircraft industry, chucks a 350 lb. forging of 347 stainless in its new 24″ LeBlond Regal Lathe. When this missile job comes off the tracer-equipped Regal, it will be a contoured tube weighing only 18 lb. Its walls will vary from ⅛″ to 1/16″ according to a rigid and complex pattern. Wall thickness will be held to ±.003″, ID to −.001″ +.000″, OD to ±.008″, and finish will be 20 to 30 rms. If the job is run 3 or 30 times, the same precise result will be achieved.

Dependable precision, like this, is reason enough to buy a LeBlond. And Delta Corp.'s new 24″ Regal backs it up with the versatility of spindle speeds from 18 to 1080 rpm, the capacity of 26″ swing over the bed, the reassurance of 10 hp at 1800 rpm, the repeatability of Hydra-Trace.

People expect precision with extras from the world's largest builder of a complete line of lathes (and of tracers for lathes, too). They have a right to. It's why they buy LeBlonds.





THE R. K. LeBLOND MACHINE TOOL COMPANY
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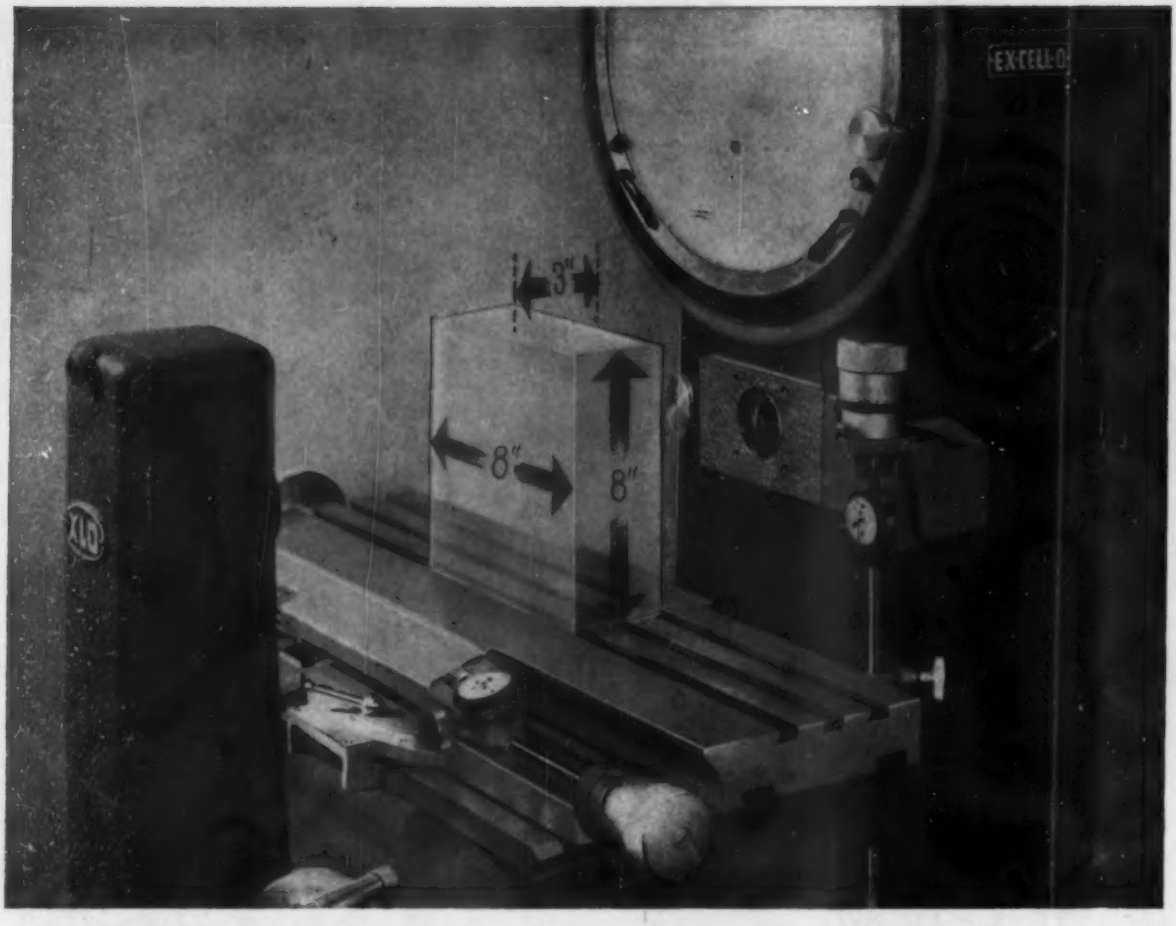
LeBLOND of Cincinnati



EX-CELL-O Contour Projectors Give You 98% More Capacity

Ex-Cell-O Models 14-5 and 30 give you capacity to accept and optically gage much larger parts than is possible with other contour projectors,—*and without repositioning on the table!*

A full 8″ of table travel in both horizontal and vertical planes, together with 3″ of focusing travel is standard on these Ex-Cell-O Models. Every point within this "block" can easily be brought into focus on the screen.

Here is real capacity,—192 cubic inches,—98% *more* than the nearest standard model! Enables users to stage shafts 16″ in diameter, (and larger in some cases), and 16½″ in length on the standard work table with standard centers. Any point along the part contour can be optically gaged with convenient table movement.

"Cubage" isn't the only Ex-Cell-O capacity Plus! You get constant 8″ of working distance (lens to focal plane) —20% more than other standard projectors. Full 8″ of vertical measuring travel. Constant throat clearance, (collimator lens to front projection lens), of 17½″ on the Model 14-5; 16″ on the Model 30;—and Ex-Cell-O's rugged, heavy duty tables enable you to stage parts weighing up to several hundred pounds.

When you are ready to talk about Contour Projectors, compare feature for feature! There is an OGP Representative near you to demonstrate Ex-Cell-O's many PLUS values. Call or write. In the meantime, let us send you "43 Reasons Why EX-CELL-O Contour Projectors are the First Choice of Industry."

You Can Purchase Ex-Cell-O Contour Projectors on Conventional Terms . . . Deferred Payment Plan . . . or Lease With or Without Purchase Option. Select the Plan Best Suited to Your Needs.

Manufactured by EX-CELL-O Corporation at Detroit, Mich.

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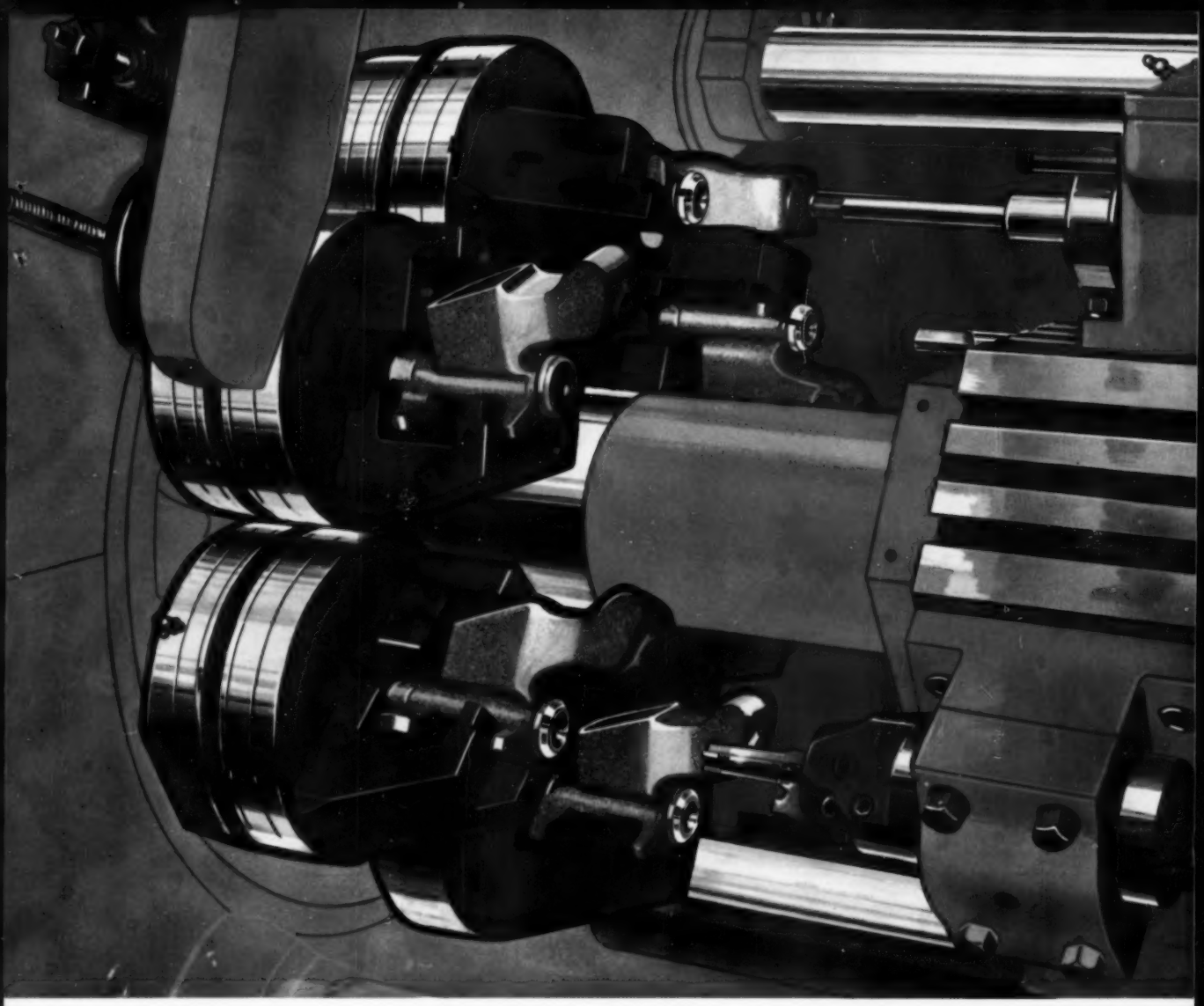
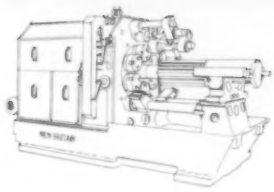
(A subsidiary of EX-CELL-O Corporation)

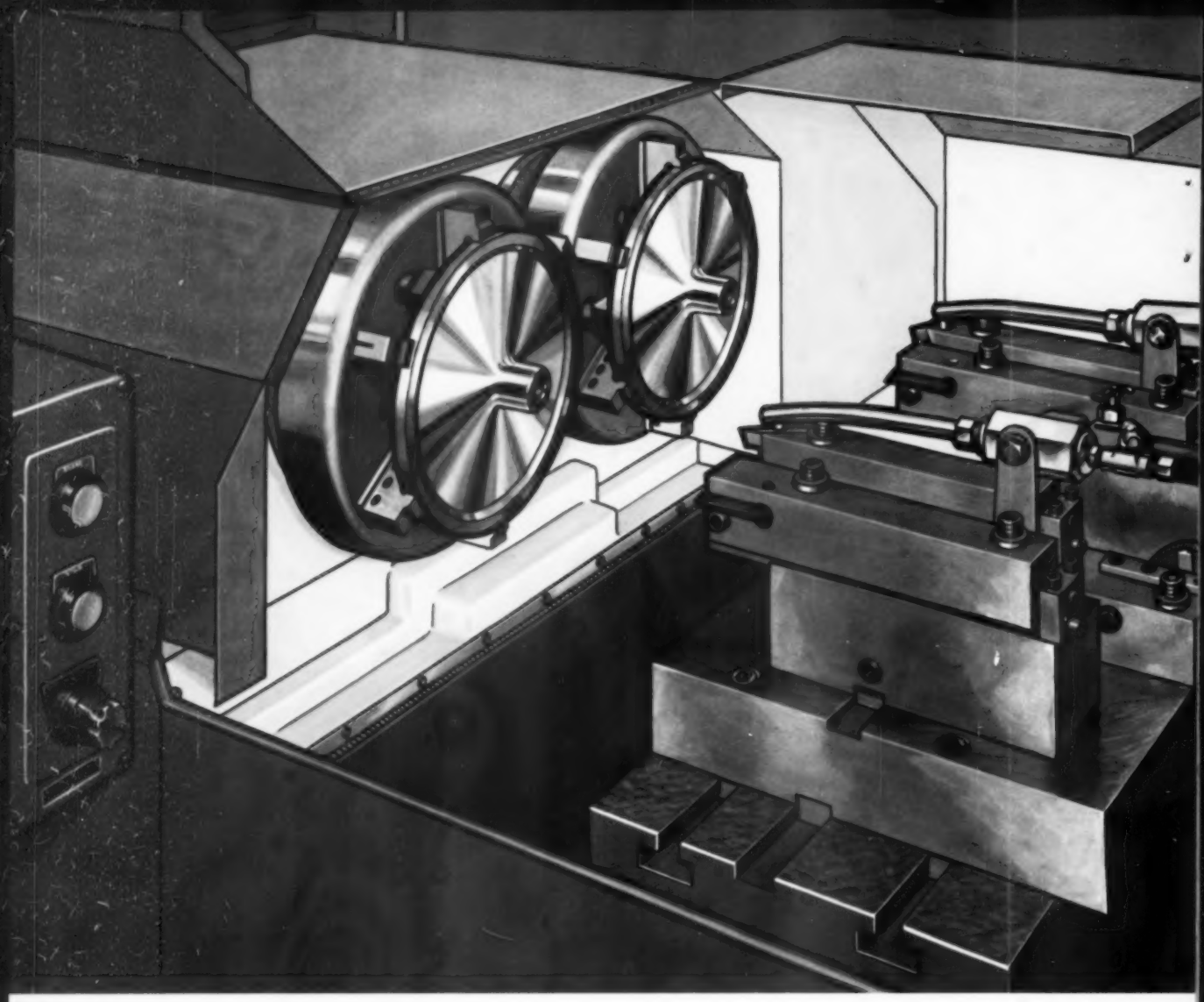


Odd shapes no problem *on New Britain Chuckers*



The peculiar problems presented by odd shaped pieces are frequently as varied as the pieces themselves. The cut may be simple enough but the how and wherefore of chucking and swinging the piece may be something else again. New Britain Chuckers can handle the widest possible range of pieces—even odd shaped work. Open-end design which allows wide open accessibility to the tooling area makes the work easier to chuck, and easier to watch during the machining cycle. Because the work area is more open, this kind of work is easier to swing on a New Britain. This is one of many extras that are built into New Britain Chuckers. Another basic New Britain difference that pays off handsomely is the exclusive forming arm design which allows for the greatest possible variety of side cuts without special set-up. The combinations of end-working and forming cuts possible are practically unlimited. This flexibility of tooling coupled with big capacity lets New Britain users perform the widest possible variety of chucking machine work. Why not call in your New Britain representative?

THE NEW BRITAIN MACHINE COMPANY
New Britain-Gridley Machine Division • New Britain, Connecticut



New Britain cam actuated *boring and contour turning*

Extreme accuracy, high productivity—even on complex contoured surfaces—these are the areas where New Britain's Vertical and Horizontal Precision Contour Turning and Boring Machines take the kinks out of production. Tool slides are cam actuated, generating contoured and straight surfaces, including sharp corners and exact radii. Time consuming wheel forming and dressing required by some methods of producing close tolerance, fine finish work are eliminated.

This is basic with New Britain and is a good part of the reason for the unbeatable repetitive accuracy of these machines. Both verticals and horizontals are simple to operate and simple in operating principle. Normally, gaging one dimension is sufficient. From one to four high speed spindles can be mounted on a single machine.

The widely accepted horizontals, or the completely new and revolutionary verticals with exclusive cam-in-head design, can be seen in action simply by contacting your New Britain representative. Whether you require one machine, several machines, the best approach to a building-block set-up, or whatever your precision contour turning or boring requirement may be, check with New Britain before you decide.

THE NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division • New Britain, Connecticut

DON'T MISS THE PRESS ROOM EQUIPMENT EXHIBIT BY U. S. TOOL COMPANY, INC. AT THE ASTME SHOW BOOTH 2250 N. Y. COLISEUM MAY 22-26

See the NEW developments that mean faster press production

U.S. TOOL COMPANY, INC.

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U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories

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3 to solve your manufacturing problems

UP TO 5-8 TIMES THE WEARLIFE OVER TAPERLOCK PLUGS BY REVERSING AND/OR CUTTING OFF WORN ENDS.

WALSH 65-Ton Deep Throat Punch Press with Variable Speed Drive Automatic Lubrication Air-Cushion. All presses "run-in" with Molykote at the factory.

CHAMPION Two-Stage Automatic Horizontal Compres OEH 38 with Exclusiv OIL MONITO (low oil le safety contr

Let our years of experience in the fields of production and precision prove beneficial to you and your products. Write or phone these firms for complete information about their important new products and services. In addition, all offer free engineering consultation services. No obligation, of course.

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With these three metronomes—or with a thousand—the time interval you choose can be positively duplicated time after time after time. And with these three PD* surface wheels—as with *all* CINCINNATI PD GRINDING WHEELS—you'll get the same kind of Positive Duplication *every time*!

HERE'S WHY . . . IN 36 STEPS

There are 36 unvarying quality control steps in Cincinnati's unique PD manufacturing process. Right from the start with the choice of the "grains" that go into a wheel, PD procedures involve exacting checks and re-checks. Every grain characteristic—from size, cleanliness, absence of foreign matter, color, magnetic content, to bulk density before and after blending—must fully satisfy extraordinary PD specifications, which are followed throughout in all 36 rigid controls.

RESULT: PREDICTABLE PERFORMANCE

You can depend on the uniformity of PD WHEELS—for each reorder wheel gives you exactly the same good job as the original. Production goes up and stays up. Costs go down and stay down. This is the promise—and performance—of Positive Duplication.

CALL CINCINNATI TODAY

Solve your grinding problems with the help of our Cincinnati-trained specialists. Their wide experience in job set-ups and grinding operations is at your service. Just call your CINCINNATI PD GRINDING WHEEL Distributor, or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

PD POSITIVE DUPLICATION

CINCINNATI®
GRINDING WHEELS

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A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

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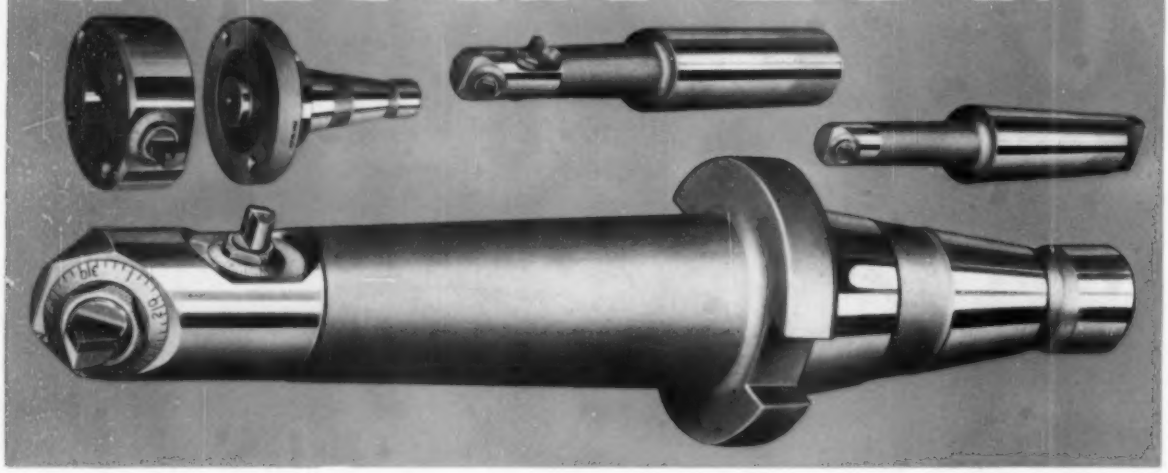
CIRCLE 300 READER SERVICE CARD

FROM DEVLIEG

microbore® precision tooling center

MICROBORE



Imitated but never equaled, MICROBORE is the single point tooling system with micrometer vernier adjustment. Designed for all boring, turning and facing operations, the basic MICROBORE system includes over 300 standard single point tools from stock with carbide, ceramic and high speed steel tips • special cluster tooling • Flash-Change tooling • adjustable blade facing heads • tooling with Kendex "throw-away" inserts. And not just a product line, MICROBORE is a complete service comprised of well schooled sales engineers, tool design engineers, highly specialized plant facilities, field service and tool maintenance. Write for complete information.

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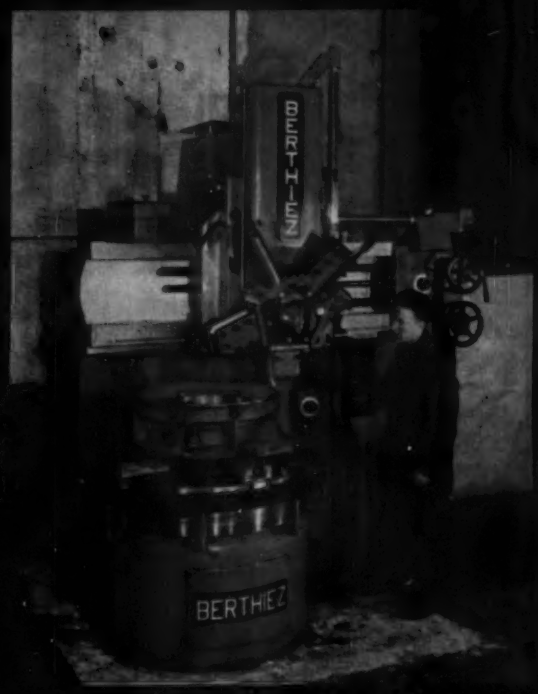
Type BM 125

with fixed table



Type J 100

BERTHIEZ

Single Upright VERTICAL BORING and TURNING MILLS

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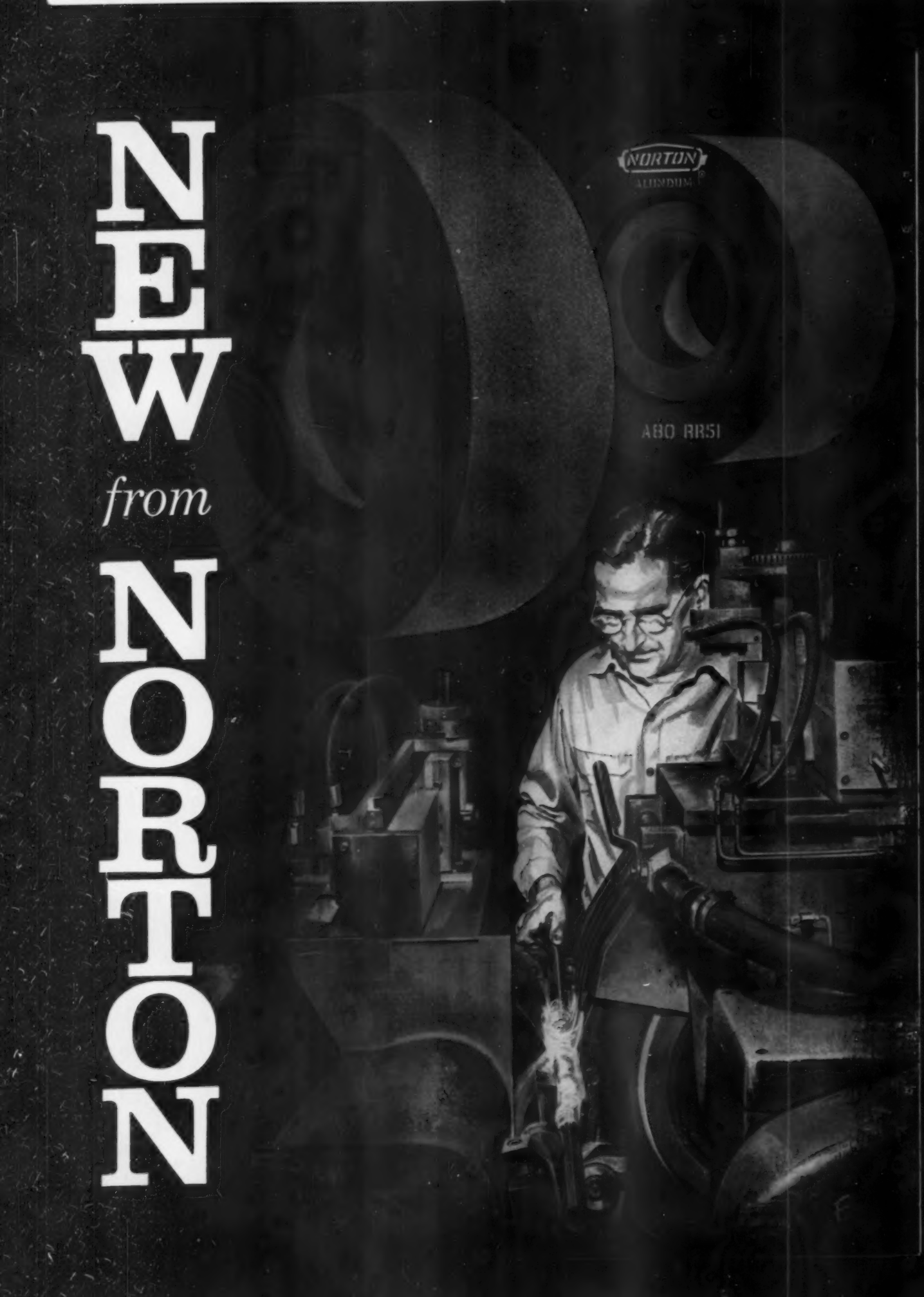
Type 9375

with displaceable table

Type 9135

NEW *from* NORTON



The top-ranking wheel team for centerless grinding

The 23 ALUNDUM grinding wheel and R51 feed wheel . . . the best performing, longest lasting combination on any centerless grinder.*

Although centerless grinding is a two-wheel operation, it doesn't need to be a two-brand buying chore.

HERE'S WHY.

Norton now offers this outstanding wheel team for production-precision and economy in centerless grinding . . .

- *The 23 ALUNDUM grinding wheel for premium performance at non-premium price.*
- *The R51 bond feed wheel for positive feed and accurate work support plus long service life.*

23 ALUNDUM Abrasive is no ordinary aluminum oxide. In price it is *non*-premium . . . but with *premium* toughness and sharpness . . . and fast, free cutting action that means *premium* performance.

23 ALUNDUM wheels have other important advantages: friability, which minimizes dressing . . . uniform duplication, for uniform performance . . . and versatility, for grinding all steels, Meehanite, aluminum and many other metals.

Teammate R51 is not just another feed wheel. This special Norton abrasive-and-bond combination has thoroughly proved the importance of the feed wheel to accurate, low-cost centerless grinding.

Reports from plants all over the country credit R51 wheels with exceptional performance, minimum dressing and no slipping or chatter. And Norton quality control keeps them uniform from wheel to wheel and lot to lot.

On the new Norton No. 2 Straddle-Bearing Centerless Grinder — or on any other machine of this type — 23 ALUNDUM grinding wheels and R51 feed wheels make your best matched team for low cost, volume production centerless grinding. For expert aid in wheel selection, and a test run in your plant, see your Norton Man, a trained Abrasive Specialist, or your Norton Distributor, NORTON COMPANY, General Offices, Worcester 6, Massachusetts. Plants and distributors around the world.

*Trade Mark Reg. U.S. Pat. Off. and Foreign Countries

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CIRCLE 306 READER SERVICE CARD ►

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Tunnel vision! Restricted outlook! Tunnel vision acts as a fifth column in America's war for economic survival. It causes **management** to see only the balance sheet and ignore the pressing need to retool. It causes **labor** to picture only pay hikes without compensating productivity. It causes **government** to kill, with unrealistic depreciation allowances, the goose that lays its golden tax eggs. Tunnel vision distorts American industry. Let's open our eyes. It's later than we think.

A machine tool is only as good as the CUTTING TOOL it drives. The industrialist who "economizes" on a cutting tool defrauds himself—not only of machining accuracy but of the increased production and resulting profits which can be delivered. Pratt & Whitney Cutting Tools will bring out the best in your machine tools, will help win **your** battle for economic survival.

Pratt & Whitney

HEADQUARTERS FOR AMERICA'S WAR AGAINST OBSOLESCENCE

machine tools / cutting tools / gages

A MAJOR INDUSTRIAL COMPONENT OF FAIRBANKS WHITNEY CORPORATION

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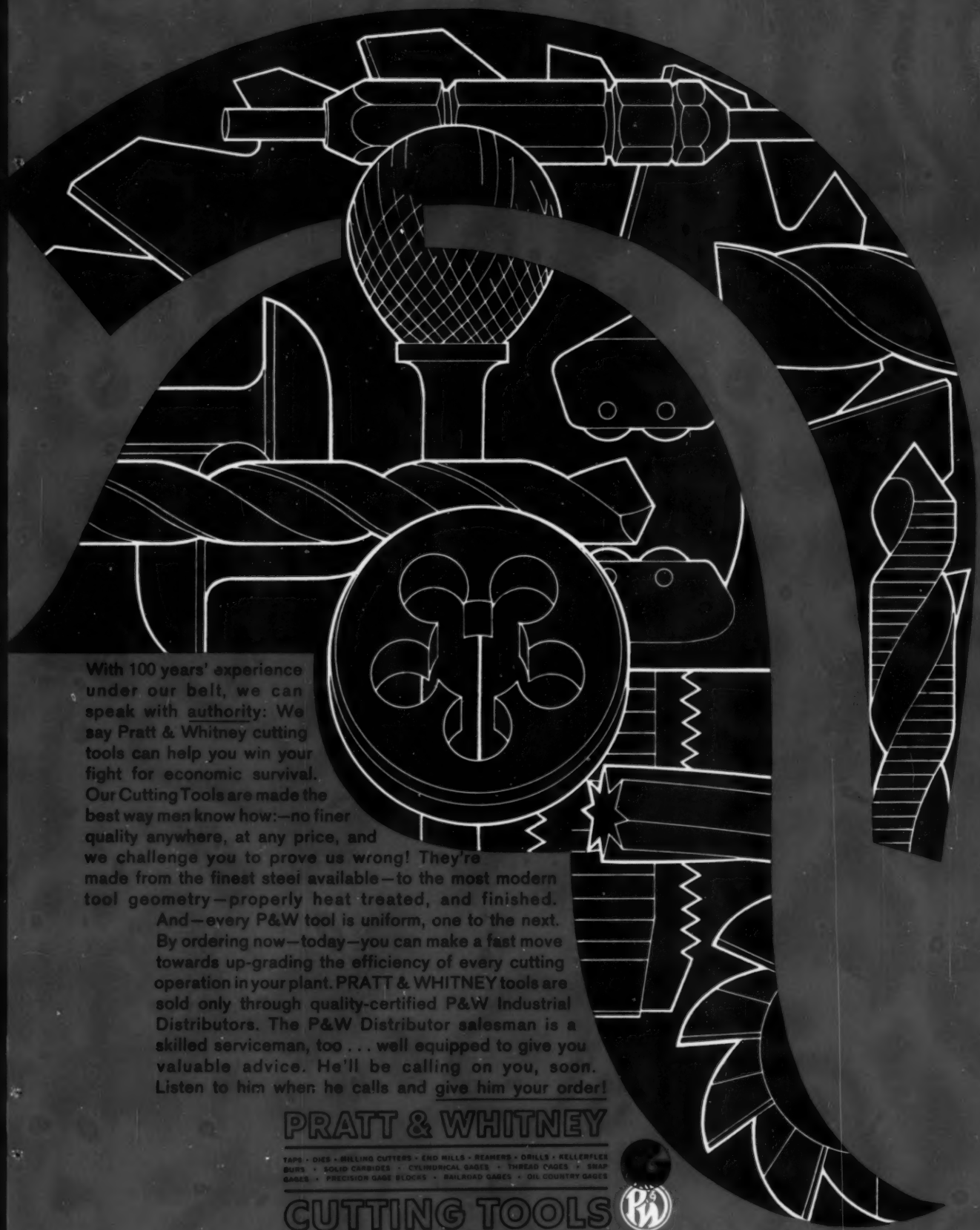
CUSTOMERS WHO WANT TO WIN
THE FIGHT FOR SURVIVAL



With 100 years' experience under our belt, we can speak with authority: We say Pratt & Whitney cutting tools can help you win your fight for economic survival. Our Cutting Tools are made the best way men know how:—no finer quality anywhere, at any price, and we challenge you to prove us wrong! They're made from the finest steel available—to the most modern tool geometry—properly heat treated, and finished.

And—every P&W tool is uniform, one to the next. By ordering now—today—you can make a fast move towards up-grading the efficiency of every cutting operation in your plant. PRATT & WHITNEY tools are sold only through quality-certified P&W Industrial Distributors. The P&W Distributor salesman is a skilled serviceman, too . . . well equipped to give you valuable advice. He'll be calling on you, soon. Listen to him when he calls and give him your order!

PRATT & WHITNEY

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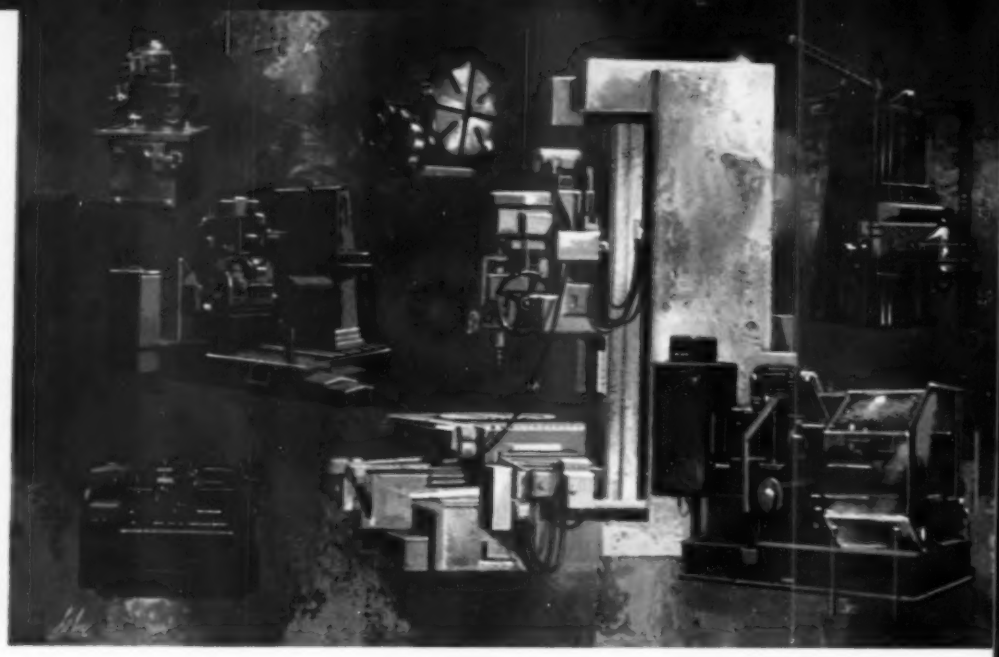
CUTTING TOOLS

P&W MACHINE TOOLS

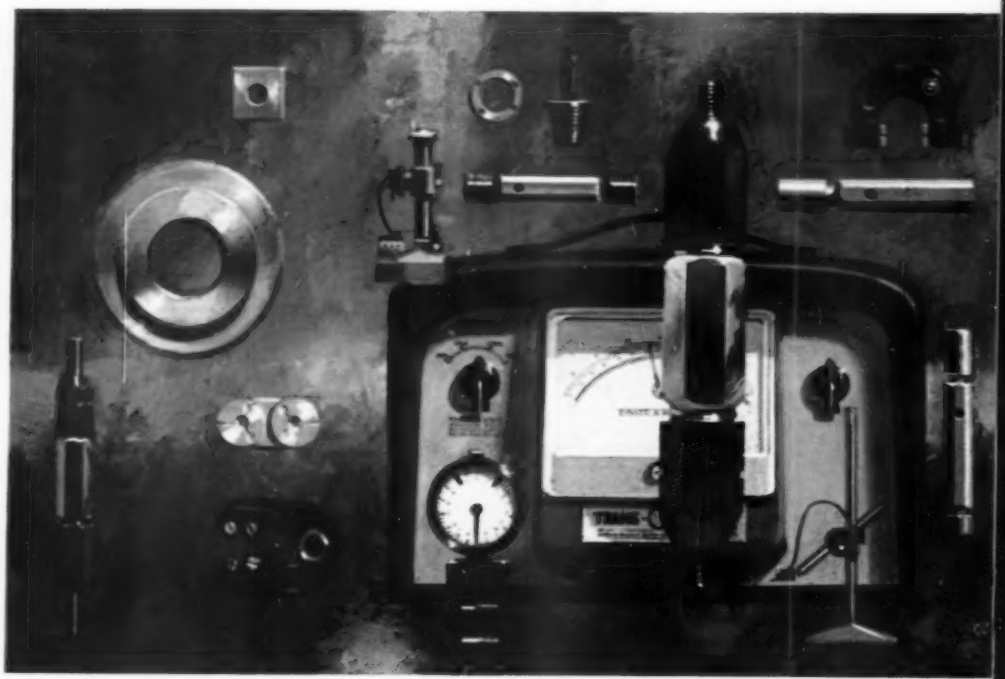
Are you producing prototypes, dies, large or small lots of production parts? Ultra-precision locating (to "tenths" accuracy)? Boring, profile milling (with or without masters)? All these and countless other problems can be solved with P&W machine tools at production line speed, efficiency and economy. Machines such as the world-famous P&W KELLER,® P&W JIG BORER, P&W ROTARY TABLE and P&W POTTER & JOHNSON AUTOMATIC TURRET LATHE are available with manual or numerical controls in a variety of models to fit your needs. P&W can also supply the MAGNETRACE PROFILER, SIM LATHE, INNOCENTI-MITSUBISHI MILL and the DIAFORM WHEEL FORMING ATTACHMENT...high grade performers all. For more information ask your P&W representative.



IN YOUR FIGHT TO **SURVIVE** YOU NEED THE FINEST WEAPONS

P&W GAGES

More than ever, production efficiency depends on fast, precise, economical gaging. P&W supplies all types of gaging equipment. Thus, you can choose those that do your job at lowest cost... from simple CONVENTIONAL GAGES to the most intricate tape-controlled INSTRUMENT GAGES. Types include PLUG, RING, THREAD and SNAP GAGES, INTERNAL and EXTERNAL COMPARATORS, and PRECISION GAGE BLOCKS... all available through selected Industrial Distributors. The exclusive series of AIR-O-LIMIT,® TRANS-O-LIMIT® and DATA-LIMIT® gages and famous "FLYING MIKE" CONTINUOUS GAGE are available from your P&W representative. Bring your gaging problems to him.



MACHINE TOOLS – CUTTING TOOLS – GAGES • HEADQUARTERS FOR AMERICA'S WAR AGAINST OBSOLESCENCE

PRATT & WHITNEY

A MAJOR INDUSTRIAL COMPONENT OF

FAIRBANKS WHITNEY

PRATT & WHITNEY COMPANY, INCORPORATED, CHARTER OAK BOULEVARD, WEST HARTFORD, CONNECTICUT

COMBINES...

IN THE BROADEST LINE OF INDUSTRIAL FILTRATION EQUIPMENT

Stop in at the CFC booth (#214) at the Design Engineering Show in Detroit and see the complete selection of CFC filters.

From Air to Zinc Cyanide — a CFC filter is installed on every type of industrial filtration job. Ranging from a 5 CFM FULFLO air filter to automated DELPARK coolant filters for central systems handling hundreds of pounds of sludge every hour, CFC equipment is used for every filtration operation — for air, oils, coolants and chemicals.

CFC filters are the choice of industry because they have been proven under diverse and critical operating conditions . . . because CFC has 25 years of design engineering experience in every type of filtration . . . because, from over 4311 standard models and media, plant and design engineers can be sure they will get the best filter available, at the lowest cost.

COMMERCIAL FILTERS CORPORATION
MELROSE 76, MASSACHUSETTS
PLANTS IN MELROSE, MASSACHUSETTS AND LEBANON, INDIANA

◄ CIRCLE 307 READER SERVICE CARD

CIRCLE 308 READER SERVICE CARD

ANOTHER REASON TO SPECIFY **GENERAL ELECTRIC** NUMERICAL CONTROL

Cincinnati Gilbert Floor-type Horizontal Boring Mach., G-E Mark II NPC

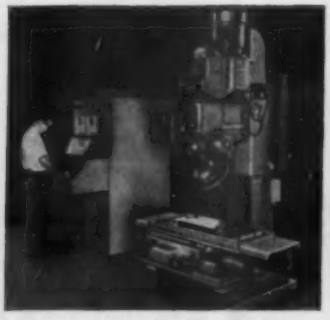
Edlund Edlund-Matic (TM) Drilling and Tapping Machine, General Electric Mark II NPC

LeBlond Tape Turn Lathe, controlled by G-E Mark Century Numerical Contouring Control

Hill Beam Drilling Machine, General Electric Mark IV NPC

Moline Tube Sheet Drilling Machine, General Electric Mark II NPC

Fosdick Fosmatic Turret Drill with Automatic Depth Control, General Electric Mark II NPC



Brown & Sharpe Turr-E-Tape Six-spindle Turret Drilling Machine, G-E Mark II NPC

Wiedemann Turret Punch Press, General Electric Mark II NPC

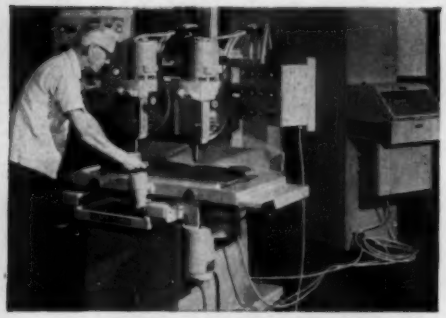
Selected by 50 machine-tool builders,

A double vote of confidence for General Electric's unmatched experience in designing, building, and applying numerical controls is evidenced by . . . the more than 50 builders who put them on the machines they sell . . . and, the over 500 American applications where they daily prove their outstanding performance on a variety of drilling, milling, punching, turning, and boring machines.

Many builders have used G-E automatic machine control since General Electric introduced electronic tracer control in 1943. Others selected G-E control based on the Company's pioneering work to develop the first magnetic tape contouring control in 1947. And many more turned to G.E. when the first building-block "packaged" positioning control—

NUMERICAL CONTROL
FOR AUTOMATION

American Tool Travelling 19-inch Column Openside Boring and Drilling Machine, General Electric Mark II NPC



Leland Gifford Two-head Printed Circuit Board Machine, General Electric Mark II Numerical Positioning Control

TODAY'S GENERAL ELECTRIC NUMERICAL CONTROL LINE features new Mark Century Numerical Positioning and Contouring Control (rear) and job-proved Mark Series Numerical Positioning Control for two to five motions (front).

proved in 500 metalworking applications

the Mark Series—was introduced in 1957. Its on-the-job record brought selection on 26 new machines exhibited at last year's Machine Tool Exposition.

And the current outlook is even brighter. New G-E Mark Century Numerical Control—utilizing solid-state circuitry—makes possible economical precision contouring with punched-tape input.

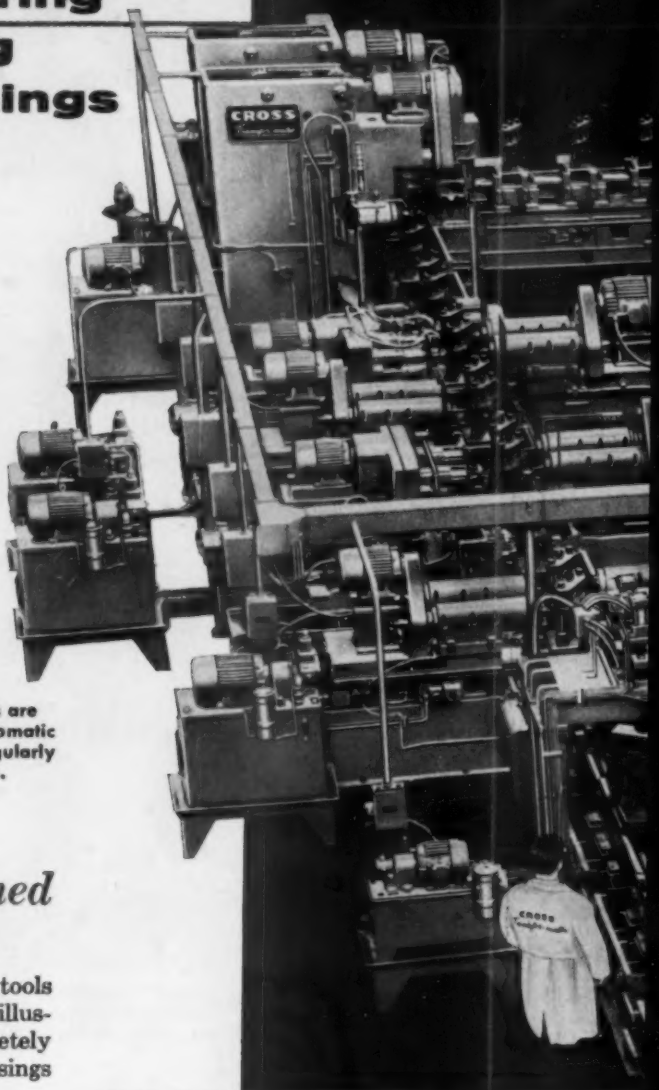
There are additional reasons to specify G-E numerical control: a full line to select from; nationwide service to minimize downtime; convenient time payment plan; and more that your machine tool builder or G-E Sales Engineer can tell you about. Or, write for descriptive bulletins to General Electric Company, Schenectady, New York. *Specialty Control Dept., Waynesboro, Virginia.* 795-13

Progress Is Our Most Important Product

GENERAL ELECTRIC

Milling, Drilling, Boring and Assembling Steering Gear Housings

Close tolerances are maintained in automatic processing of irregularly shaped parts.



New Transfer-matic Designed to Prevent Obsolescence

A typical example of how transfer type machine tools can be designed to guard against obsolescence is illustrated by this new Cross Transfer-matic. It completely machines and assembles power steering gear housings except for the mounting feet.

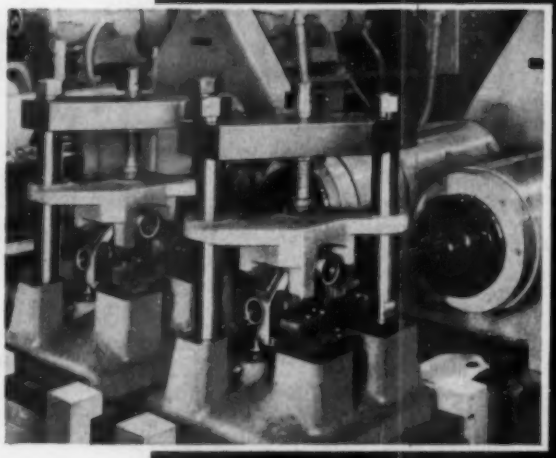
Useful life has been materially increased by building the Transfer-matic to process housings with longer pitman shaft extensions than those now being produced. Three idle stations permit other operations to be added and the use of standard Cross "building blocks" provides further flexibility for part design changes.

Present operations include milling, drilling, boring, counterboring, spot facing, chamfering, tapping, deburring, and assembling the worm thrust bearing cups and the pitman shaft bushings in the housings. Rated production is 300 pieces per hour.

A special feature is the provision for off-line inspection of the pallets and the parts without loss of production.

Another feature is the provision for in-line inspection at three different stations and final inspection just before the assembly operations.

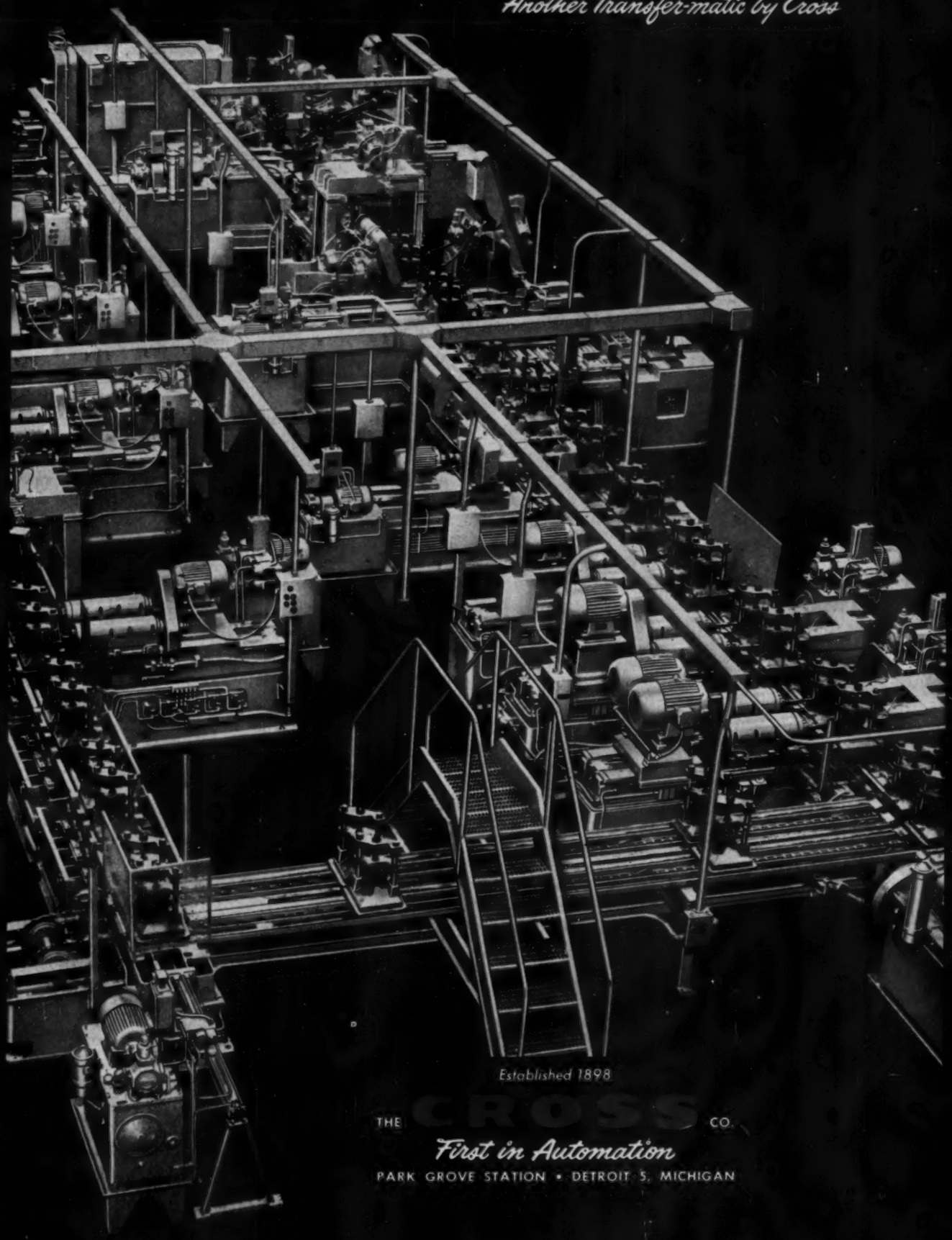
If you would like to know more about these and other Cross innovations, just drop us a line.



Precision boring of the worm shaft hole—two at a time.

CIRCLE 311 READER SERVICE CARD

Another Transfer-matic by Cross

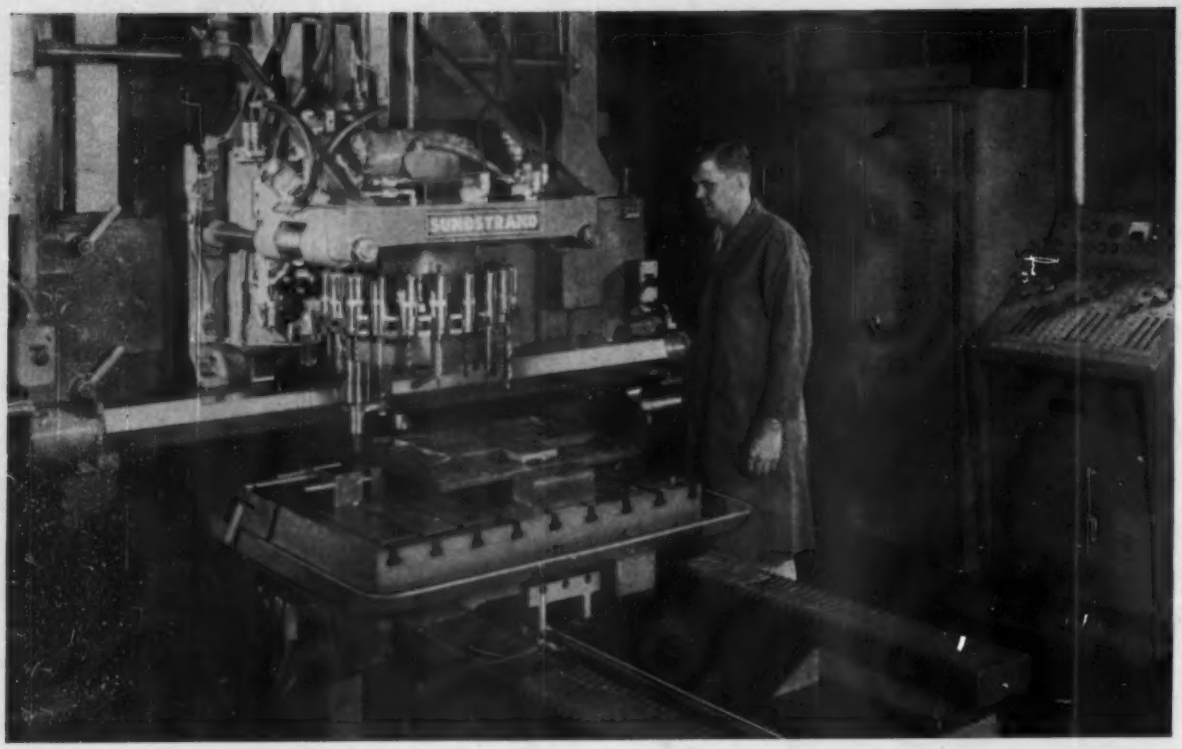


Established 1898

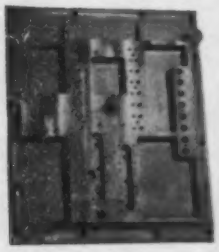
THE CROSS CO.

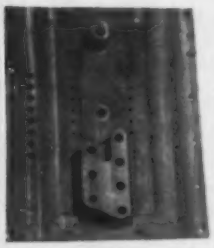
First in Automation

PARK GROVE STATION • DETROIT 5, MICHIGAN



260 operations performed in one-fifth the time by Sundstrand numerically controlled machine with automatic tool changer





Nineteen tools perform over 260 drilling, chamfering, counterboring, tapping, reaming and slot milling operations on top and bottom of part in 3-1/2 hours compared to 17-1/2 hours by previous method.

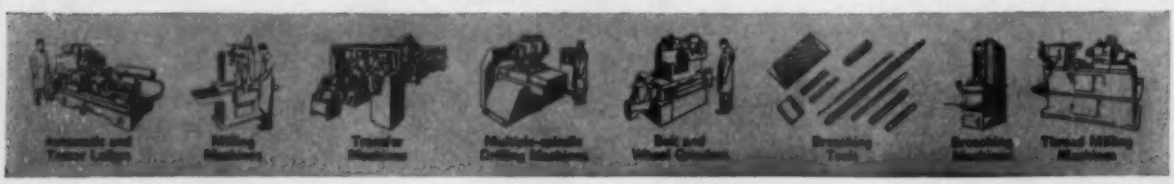
The broad range of Sundstrand N. C. machines is shown in bulletin NC-626. Write for your copy. Included is information on Sundstrand's complete line of key driven drill drivers, tap holders, end mill holders, adjustable boring bars all designed to fit or interchange with any Sundstrand Numerically Controlled Machine or automatic tool changer.

The parts illustrated at the left typify the range of work on which dramatic cost reductions can be achieved by the Sundstrand Model 21 automatic tool change machine with 66½" x 44" table working surface. Over 260 drilling, chamfering, counterboring, tapping, reaming, and slot milling operations were performed in 3½ hours as compared to 17½ hours by the old method.

The Model 21 is available with either a single-spindle rail-mounted head or with optional 20-position tool changer for drilling, boring, reaming, tapping, and light milling. Tools up to 3" diameter are selected, loaded in the spindle, and replaced automatically.

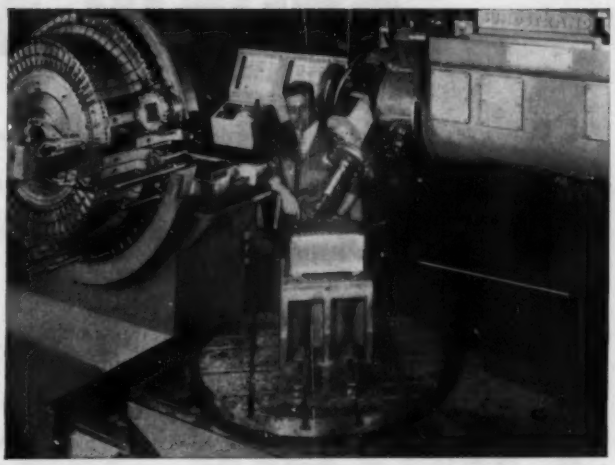
The machine is available with either positioning or contouring control, providing almost unlimited versatility on an exceptionally wide range of work.

Demonstrations can be arranged upon request.

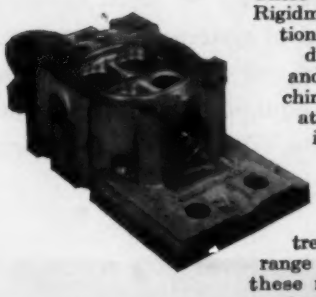


5-axis NC Omnimil machines at any angle, saves set-ups and handling

Single machine "production line" that mills, drills, bores, reams, taps all exposed faces of the workpiece at any angle —machines many parts in a single set-up — reduces handling of workpiece to improve accuracy. Made in two sizes, the 15 hp Model OM-3 has 48″ X-Y-Z axial movements, 42″ dia. rotary table, and optional automatic tool changer. The 40 hp OM-4 has 96″ X and Y and 72″ Z axial motion, with 58″ dia. rotary table. A pendant controlled power-assist for changing heavy tools is optional.

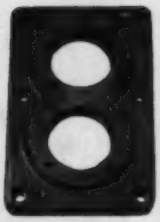


3-axis NC horizontal machines speed multiple operations on a wide range of parts



These are basic Sundstrand Rigidmils with numerical positioning control for milling, drilling, boring, reaming, and tapping. Ideal for machining long parts, one side at a time, or with optional index base for machining various faces of parts whose dimensions do not exceed table widths. Extreme versatility and wide range of applications make these machines among the most productive available per dollar of machine investment. Table widths — 18″ to 38″. Table travel — 54″ to 216″.

3-axis NC turret-type machine drills, taps, bores, reams automatically

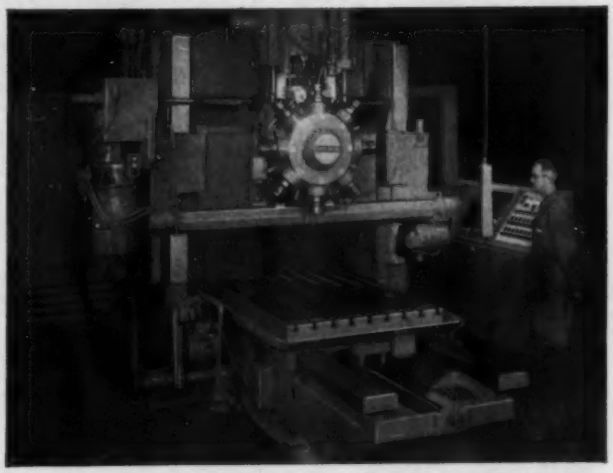


This extremely versatile machine for hole work handles workpieces up to 40″ wide x 60″ long x 30″ high.

All motions, including rotation of the eight-spindle turret can be operated by numerical or manual pushbutton control. Automatic depth control insures accuracies without operator attention.

Machine is also available with 2-axis control and adjustable stop dogs for depth control.

Ask for literature.



SUNDSTRAND

SUNDSTRAND MACHINE TOOL

BELVIDERE, ILLINOIS • DIVISION OF SUNDSTRAND CORPORATION

BENDIX PROVIDES SYSTEMS EXPERIENCE TO MAKE NUMERICAL CONTROL WORK FOR YOU

Numerical control is a proved concept in metalworking. It has demonstrated its worth in scores of applications, but perhaps your manufacturing problems are different. Why not enlist the services of Bendix—long-time supplier of practical, reliable numerical control systems to most major machine tool builders. Let us be your prime source of information and assistance when the demand for increased productivity indicates a need for more modern equipment that will reduce scrap, reduce lead time, reduce inventory costs, and reduce tooling costs. Whether it's contouring, positioning or measuring, Bendix has the solution to your particular problem.

Versatility of Bendix DynaPath contouring controls is illustrated by this machine tool which will grind, turn or mill in two or three axes, with 0.0001-inch tool path accuracy.

YOU NEED BENDIX SYSTEMS EXPERIENCE when you consider numerical control for your application! Bendix offers:

1 JUSTIFICATION STUDIES—what can numerical control do for you?

2 SYSTEM ENGINEERING—applying the right control to the right machine tool.

3 TRAINING AND SERVICE—for maximum machine utilization rates.

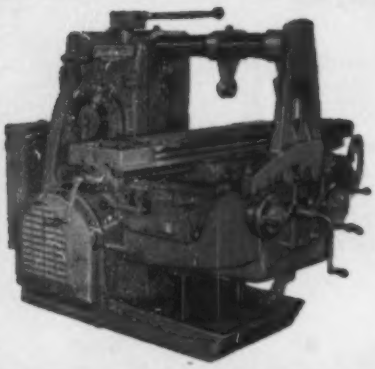
The unique Bendix Systems Experience is backed up by a staff of experienced electronic, mechanical and hydraulic engineers, mathematicians, instructors, technicians, and parts planners. Our contract machining and tape-making facilities offer years of accumulated case histories on all manner of applications *and* a chance to check out *your* problems in actual practice. Why not write today for more information on Bendix Systems Experience.

Industrial Controls Section
21820 Wyoming Ave., Detroit 37, Michigan

THE Bendix CORPORATION

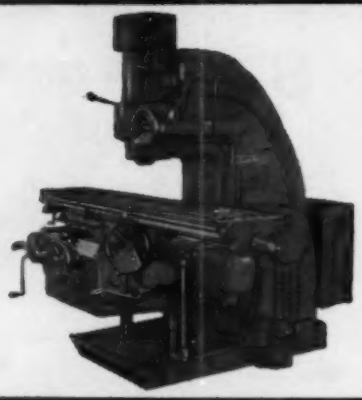
Bendix
SYSTEMS EXPERIENCE
For tool room work, Bendix DynaPoint positioning systems can hold 0.0001-inch tolerances on this jig borer.
With Ferranti numerical control, this turret drill will do the work of several conventional machines, and reduce scrap.

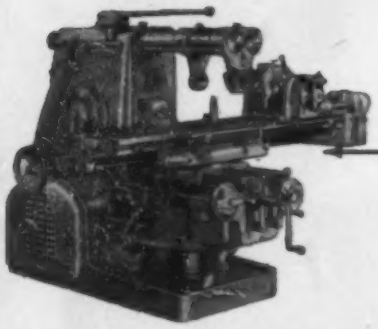
Kearney & Trecker machine tools quality . . . greater economy and



TF Series Knee Type Milling Machines

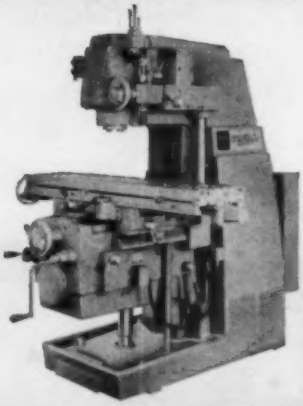
Strikingly new milling machines feature twin screw knee support for greater rigidity; new control center for ease of operation; improved Mono-Lever and Automatic Cycle Table Control; front-mounted backlash eliminator; adjustable saddle clamping gib; three bearing spindle that increases rigidity eight times over spindles without center bearing support, and many other features. TF's are available in five sizes Plain (left), Universal and Vertical (right) styles from 10hp to 50hp. (Catalog No. TF-58)





CH & S Series Knee Type Milling Machines

These modern knee type milling machines incorporate the latest design and operating features . . . greater capacity for power, speeds and feeds. Machines are available in Plain, Universal and Vertical styles . . . 5 to 15hp. (Catalog No. CH-59 and S-60).

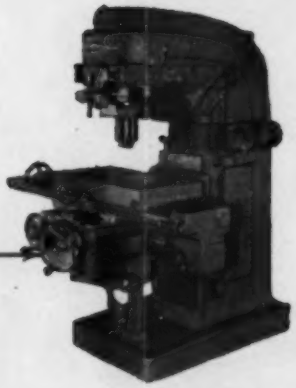


Attachments and Accessories

A complete selection for every milling requirement to convert standard machines into special purpose tools. Provide maximum productivity by supplementing with any of the various Kearney & Trecker standard attachments. Bulletins available on request.

Model 2D Rotary Head

Rotary head motion, combined with milling machine's ability to do boring, slotting, drilling, vertical milling, circular and angular milling, transmits complete blueprint into metal without changing setup. Speed range 250 to 4000 rpm; feed range .0002 to .008 ipr; rotary head feed range (16 changes) 2 to 3 rpm. (Catalog No. D-20)



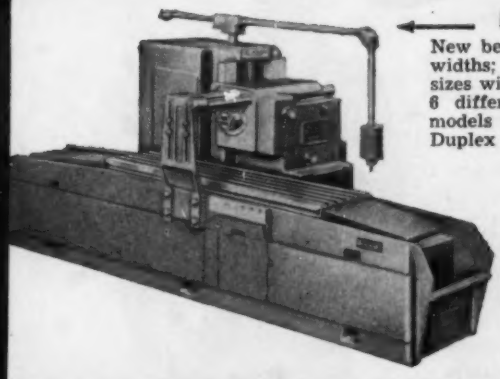
Designers and Builders of Precision and Production

offer you more productivity and performance than ever before...

TODAY, Kearney & Trecker gives you several complete new lines of knee and bed type milling machines, precision boring machines and special production machines to meet growing metalworking needs.

Note the *exclusive* twin-screw support of the massive knee and saddle on the new TF Series milling machines... the compact, central control grouping... profit-making features typical of the advanced design you'll find on every machine shown.

For complete information on these new machines, see our nearest representative. Ask for catalogs listed here, or write Dept. CM58, Kearney & Trecker Corp., Milwaukee 14, Wis.

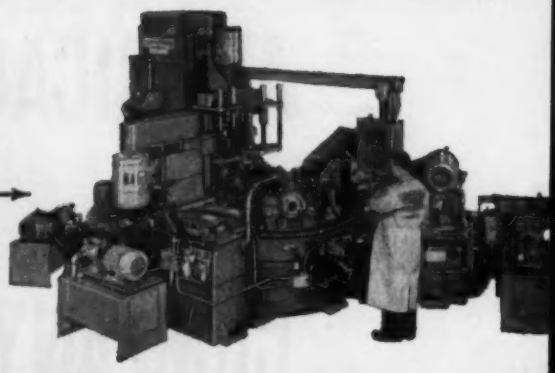


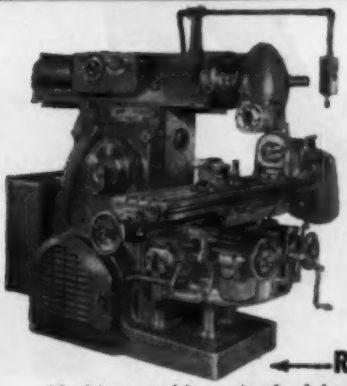
Mil-waukee-Mil Series

New bed-type design features: 2 table widths; 6 table sizes; 2 spindle head sizes with 3 speed ranges in each size; 6 different hp ratings; 72 standard models available in Simplex and Duplex Models. (Catalog No. MM-58).

Special Rotary Indexing and Transfer Machines

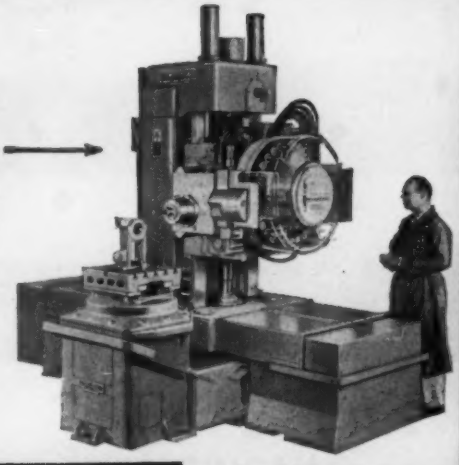
This 5-station rotary indexing machine features standard units: feed slides, quill feed, drill power units and rotary index table. Other special machines available. (Catalog No. SMD-10 and Data Sheet 1076)





Numerically controlled MILWAUKEE-MATIC

This single unit, tape-controlled machining center, unifies three basic processes — milling, drilling and boring. It is flexible automation of simple and complex machining operations on small- and medium-size lot production. Thirty-one tools are changed automatically on this new tape-controlled production machine. (Catalog No. TG-58)



Ram Head Milling Machines

Machine combines standard horizontal spindle with separate motor-driven vertical spindle mounted on sliding Ram. Ram may be equipped with either Universal, Vertical or Quill type head. Machines available in No. 2 to No. 4 sizes, Plain and Universal styles (Catalog No. RH-10)

Machine Tools Since 1898

KEARNEY & TRECKER MILWAUKEE

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AMERICAN

A sales organization especially trained to serve industrial and fleet customers . . . 74 District Offices and 13 Regional Offices . . . 4,100 warehouses and distribution points . . . 12 refineries . . . more than 2,000 products to serve you . . . this is American Oil Company.

CIRCLE 319 READER SERVICE CARD

The American Oil Company representative who calls on you receives special training in servicing industrial and fleet customers at our Sales Engineering School. His training begins with a concentrated course in petroleum product quality and application. According to a planned schedule, he returns for an advanced course and then again for post-graduate work. From our Marketing Technical Service Department, your American Oil representative draws assistance, when needed, from specialists who are recognized authorities in their fields. These specialists may be called in at any time to work with you on your lubrication problems. More than a thousand research scientists and technicians at our research laboratory support the effort of our representative to serve you. Their mission: To help your American Oil representative help you lower your maintenance costs and stretch your maintenance dollars. Learn more about American Oil, its men, its service, its products.

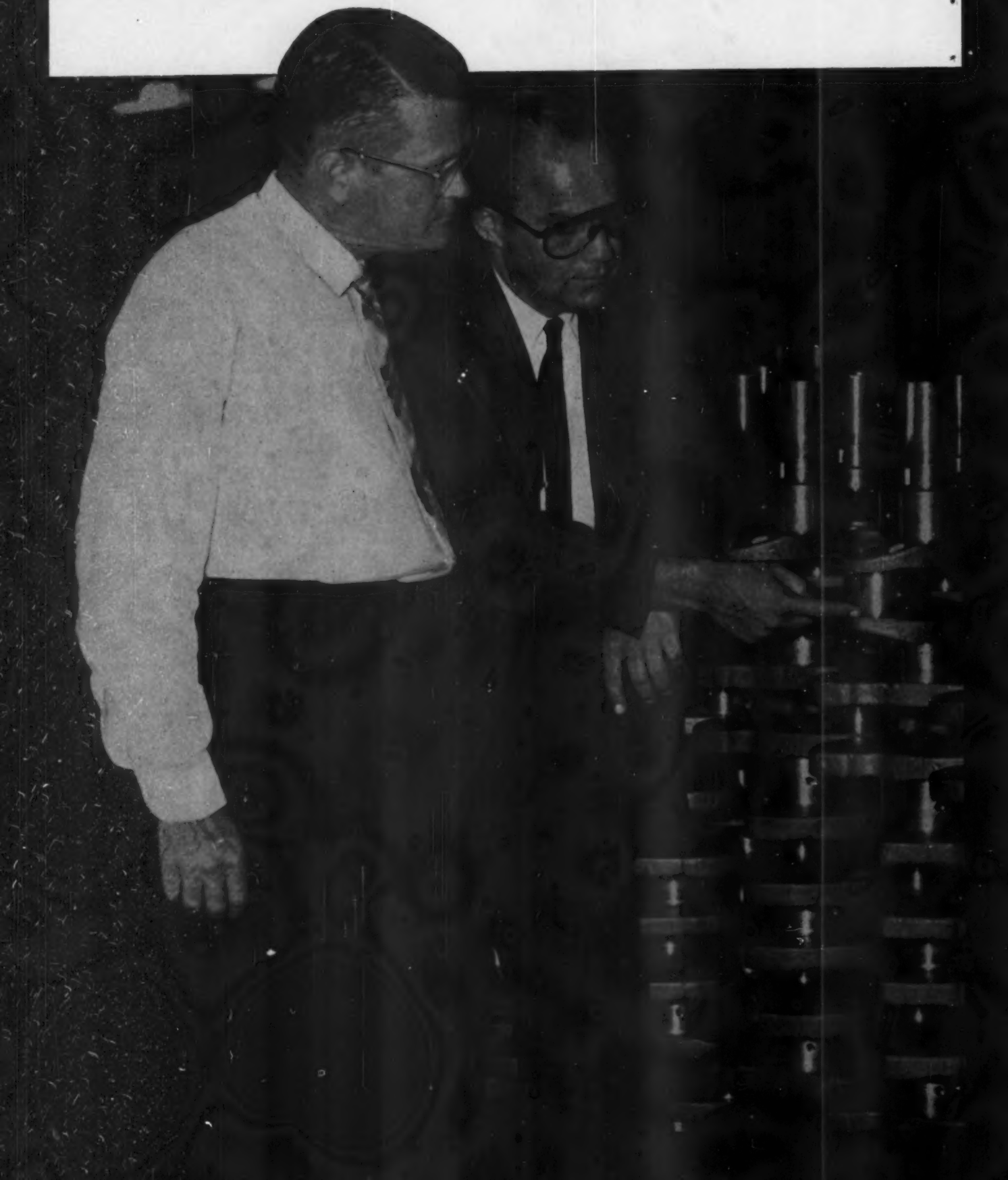
AMERICAN

AMERICAN OIL COMPANY

910 S. Michigan Ave., Chicago 80, Ill.

CIRCLE 320 READER SERVICE CARD

How Norm Nesbitt and Allen Moore



teamed up to cut dressing costs 50% at ATLAS CRANKSHAFT

This is a good example of the way it sometimes pays to break a habit even when it's a pretty *good* habit.

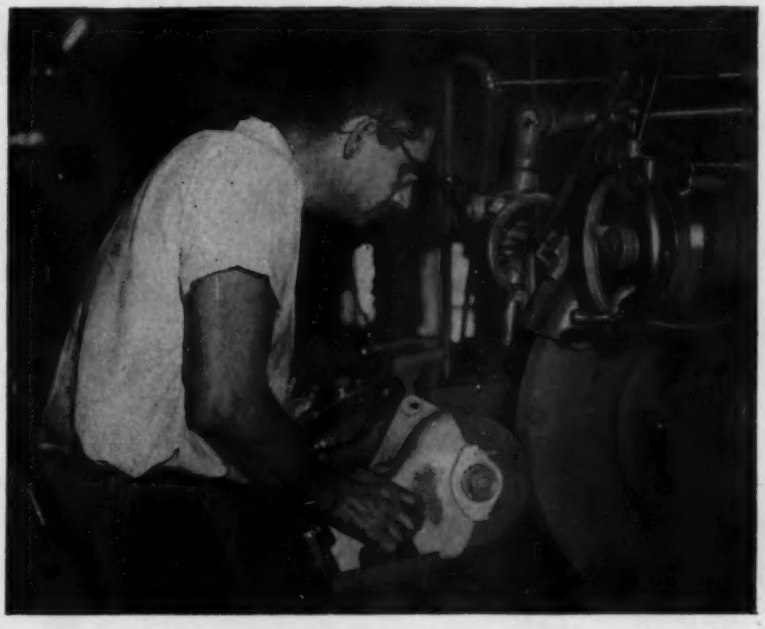
At Atlas Crankshaft Corp., in Fostoria, Ohio, the dressing wheels that are used to keep big crankshaft grinding wheels at peak performance play a very important part in maintaining production at a high and constant volume. There was nothing really wrong with the 6" dressing wheels Atlas had been using for years. They did a pretty good job and usually lasted through an 8-hour day.

But Atlas' Purchasing Agent Norm Nesbitt wasn't content with "good enough". He wanted "better" and had his eye firmly fixed on no less than "best". He got hold of Bay State representative Allen Moore and told him to go to work on the problem.

Moore is thoroughly accustomed to the kind of abrasive problems that require long and painstaking analysis. But this time, he found that it was a case of the solution being so simple that nobody had thought of it.

He simply recommended a larger dressing wheel . . . an 8-inch wheel instead of the 6-incher that was being used. Both wheels were stubbed at 4" but buying the larger wheel reduced the cost per cubic inch of usable abrasive 50% and cut the number of dressing-wheel changes from one a day to one every two days.

Not all abrasive problems are as easily solved as this one, of course. But the point of this case is both simple and important: The most obvious improvements in grinding operations are often the most difficult to spot. Your Bay State distributor and our direct representatives are thoroughly *trained* to spot the obvious and to *dig* for what is not obvious. You can't lose and you may well gain substantially by just turning them loose to analyze your grinding operations. *Better grinding at lower cost . . . that is their business.*



Atlas operator Paul Huff sets new 8" dressing wheel against surface of big, crankshaft grinding wheel. 8" diameter dressing wheel lasts twice as long as 6" wheel because both are stubbed at 4" and 8" wheel costs half as much per cubic inch of usable abrasive.

Norman Nesbitt, left, as purchasing executive for Atlas Crankshaft Corp. for 15 years, has encountered, and successfully met, every purchasing problem "in the book" . . . and then some!

Allen Moore, abrasive specialist, with many years experience with distributors and grinding wheel manufacturers, has a broad knowledge of abrasive wheel applications. His Business Administration degree attests to his awareness of cost-savings importance.

BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

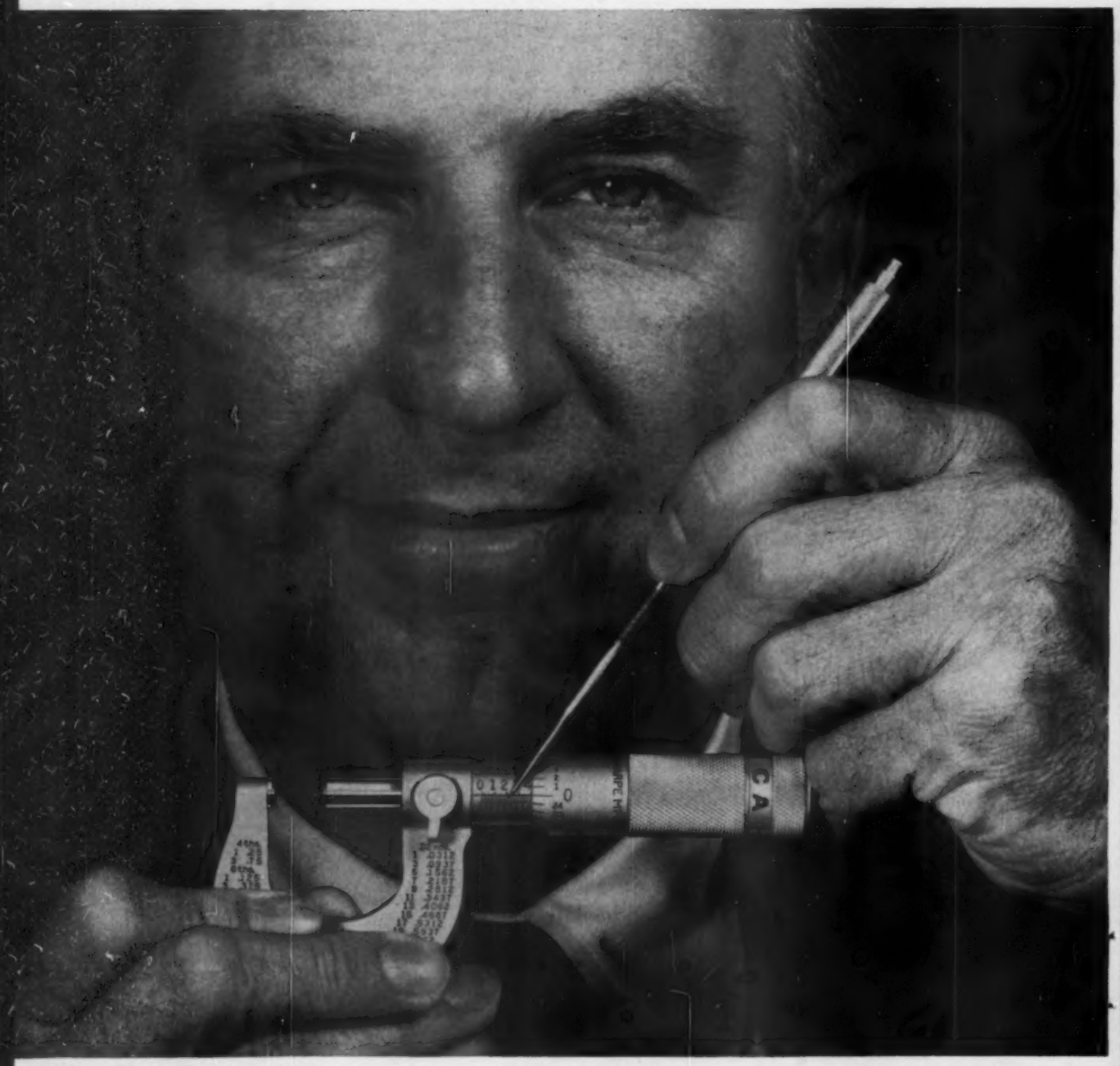
● Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. *Distributors:* All principal cities.

CIRCLE 322 READER SERVICE CARD

A "live" demonstration from Brown & Sharpe...

"Let me show you how Brown puts a stop to .025" errors –

...Mr. Thomas C. Roberts, Manufacturing Manager,



"Look, the barrel graduations are *SLANTED* on this new B&S No. 1011 Micrometer." (0-1" by .0001.")

"They can't suddenly hide under the end of the thimble, the way right-angle graduations on other mikes do — can't trick you into reading the wrong .025" line. They make it clear where you're going and where you've been. Even when you're tired or working in bad light, you read the slant-line right.

CIRCLE 323 READER SERVICE CARD

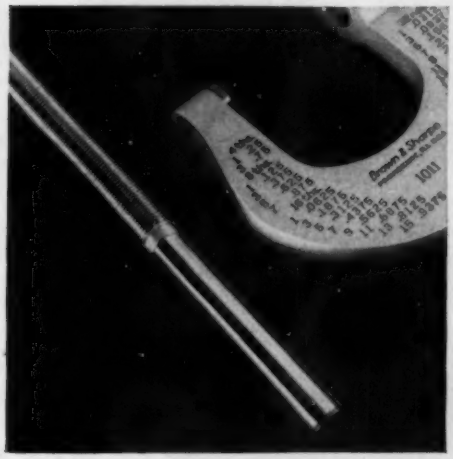
& Sharpe's new '*slant*-line' mike boosts accuracy in your shop!"

Brown & Sharpe, Industrial Products Division

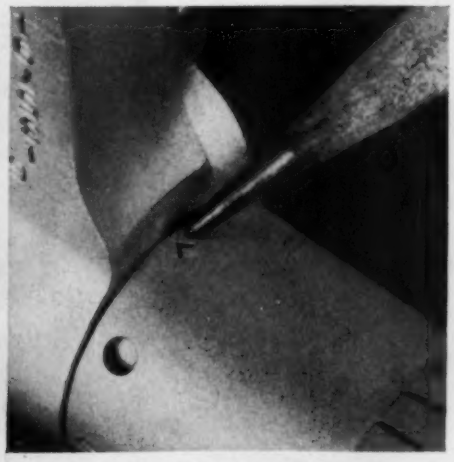
"I don't need to tell you how much trouble the old '25-thousandth error' has caused over the years. But the slanted graduations on our new Brown & Sharpe mikes put an end to it, once and for all!

"Do you like a solid-type thimble, or a 'friction' type? A twist of a knob converts the entire thimble to the type of action you prefer Operation is identical, using the same sleeve, in either case.

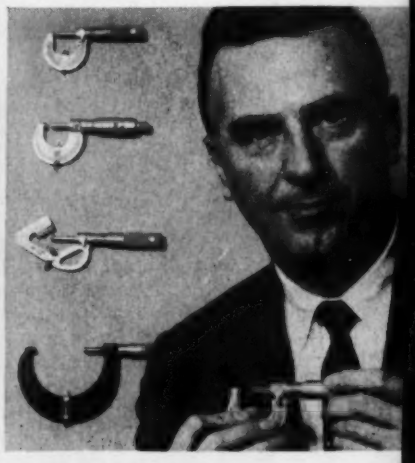
"It's a real one-hander! You can work the lever clamp, thimble and friction sleeve with one hand, even when the mike's turned out. And, notice the personal initials. — furnished at no extra charge.



"You get the corrosion resistance of a stainless steel spindle in all Brown & Sharpe micrometers with carbide faces. Faces lapped to .000030". Micrometer accuracy is guaranteed with .0001".



"Notice this Craftsman's Personal Mark. Every B&S micrometer is 'signed' twice — once by Brown & Sharpe — once by the man who assembled it to give you an extra guarantee of highest quality.



"Slant-line graduations are now available on several other models of B&S mikes, in addition to No. 1011. Check with your local industrial distributor." Brown & Sharpe Mfg. Co., Providence 1, R. I.

Brown & Sharpe PRECISION CENTER

SEE B&S MICROMETERS AT THE 1961 ASTME EXPOSITION — BOOTH 1315

CIRCLE 324 READER SERVICE CARD

NEW MODEL 1220 DYNAPAK

RUGGED POWERFUL EFFICIENT

DYNAPAK MODEL 1220 . . . massive, rugged all-new model of industry's only proven *high energy rate forming* machine! All-new Dynapak saves expensive metal chips — eliminates costly machining.

SAVES METAL
SAVES MACHINING
SAVES TIME

DYNAPAK MODEL 1220 is designed and built to work a full day *every* day . . . efficiently, dependably, economically! Dynapak uses only one-quarter of its available energy to exceed the force of a 6,000-ton press—always has power in reserve. Models with operating capabilities up to 8 strokes per minute are available.

DYNAPAK MODEL 1220 is versatile—makes a wide variety of products ranging from production tooling to complex turbine blades, missile nose cones and tiny precision surgical pins. Tool steel and the exotic "problem" metals become everyday materials to Dynapak's unique capabilities.

DYNAPAK MODEL 1220 can help *you* do a better job of forging, forming, compacting. Dynapak can help you cut costs and improve profits. Find out now about dependable, performance-proven Dynapak — the new concept in *high energy rate forming*. Write, wire or phone for complete information.

GENERAL DYNAMICS CORPORATION / ADVANCED PRODUCTS DEPARTMENT

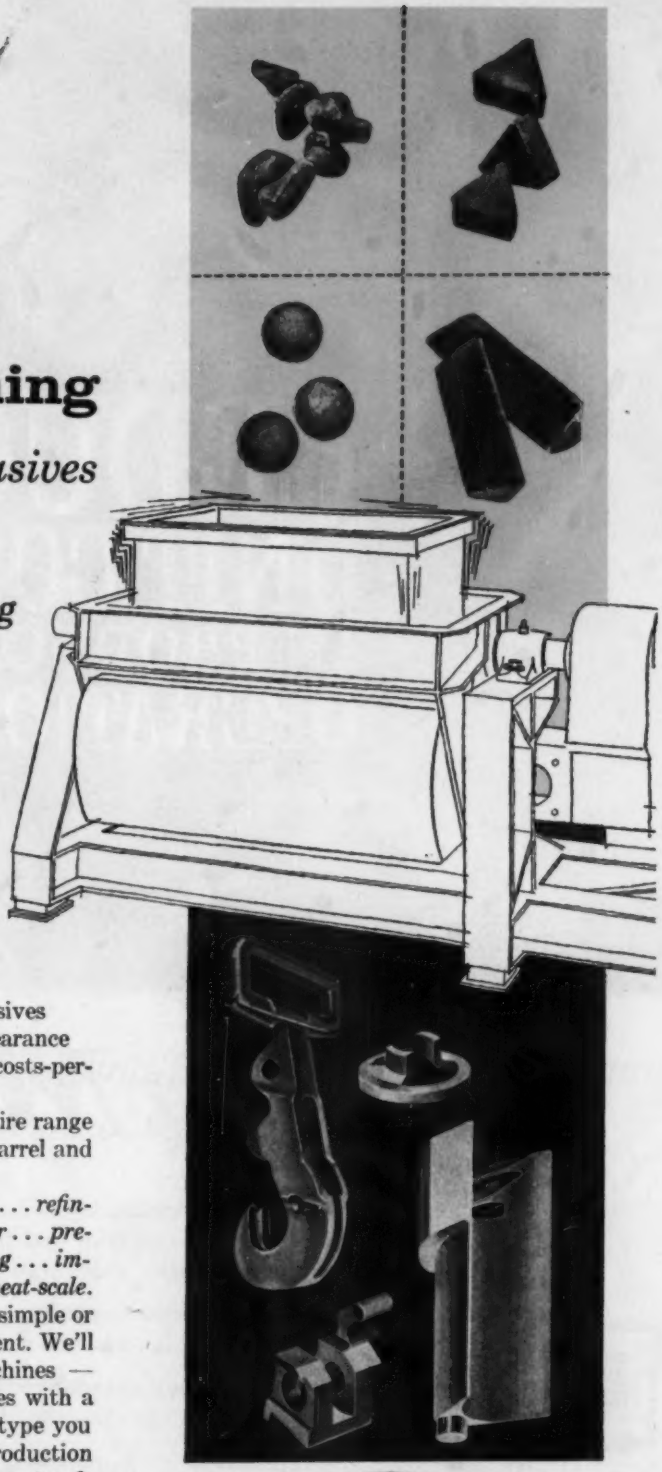
GD

P.O. Box 6231 • San Diego 6, California

Barrel finishing is best finishing

...with TUMBLEX® abrasives

... in every type of rotating or vibratory equipment



Keeping pace with the latest advancements in barrel finishing equipment, Norton TUMBLEX abrasives are first in the field for best results with vibratory machines . . . developed for faster, lower cost finishing of the widest range of parts, especially the most complicated.

The recognized advantages of TUMBLEX abrasives help assure improved product quality and appearance — plus the fastest, easiest way to cut finishing costs-per-piece . . . by this new vibration method.

These advantages are also brought to the entire range of barrel finishing operations of both rotating-barrel and vibration types, including:

Removing burrs . . . smoothing off feather edges . . . refining surface finish . . . burnishing for luster or color . . . preparing surfaces for painting, enamelling or plating . . . imparting matte finish . . . removing dirt, grease or heat-scale.

Send your samples of parts — large or small, simple or intricate — to our Sample Processing Department. We'll barrel finish them on the most suitable machines — vibratory or rotating — and return the samples with a report on the TUMBLEX abrasives and machine type you need to improve product quality and cut production costs. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

NORTON
ABRASIVES C-409

Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Non-Slip Floors — BEBB-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

REDUCE UNIT COSTS IN PRODUCTION OPERATIONS...

New Mobilmet

Whether yours is a production or job-shop operation, you can benefit from new Mobilmet oils because they assure superior tool life, excellent finishes and reduced staining in the machining of an unusually wide range of metals.

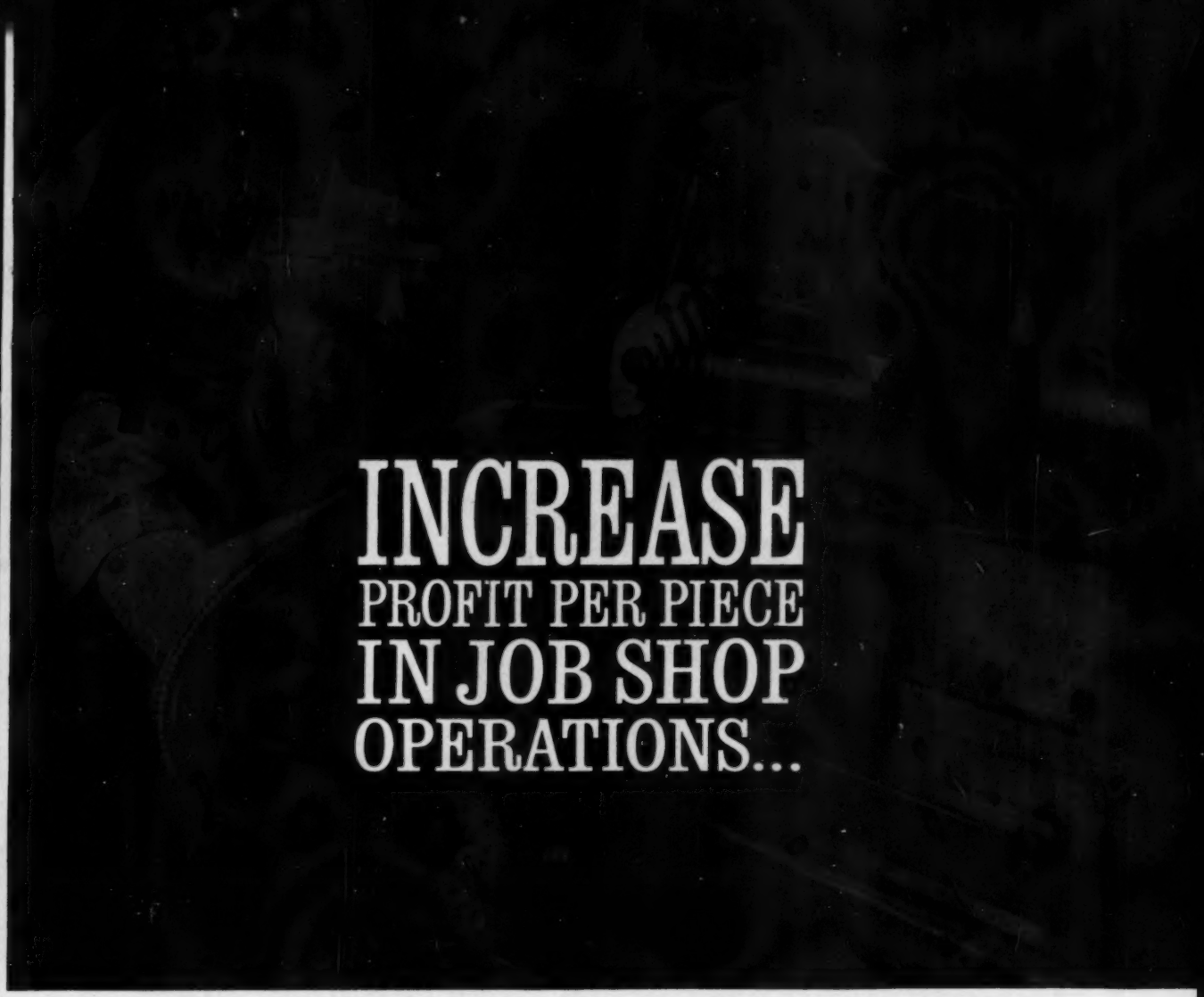
Mobil

- **In production operations** this means reduced unit costs. And by using fewer cutting oils, you save through quantity purchases and handling.
- **In job-shop operations** this means greater profits per piece. And, you reduce machine downtime for draining, changing, or blending cutting oils.

The reason for the unique versatility of Mobilmet oils is a new additive combination, developed and patented by Mobil, which is pressure-temperature selective in its activity—highly effective over the wide ranges of cutting pressures and temperatures produced in machining various metals with greatly different physical characteristics. As a result, a single Mobilmet oil is useful for both tough, draggy metals and hard, brittle metals.

Check the benefits new Mobilmet oils offer you. For complete information mail the coupon at right. Mobil Oil Company, 150 East 42nd Street, New York 17, New York.

CIRCLE 327 READER SERVICE CARD



INCREASE PROFIT PER PIECE IN JOB SHOP OPERATIONS...

Oils *multi-metal cutting fluids with unique pressure-temperature selective additive composition*

MOBILMET OILS OFFER YOU!

1 *Greater machine output*

A. More pieces per hour through increased feeds or speeds

B. Reduced time-out for tool changes

2 *Lower tool costs*

A. Fewer tool grinds

B. Less metal removed per tool grind

3 *Reduced loss from rejects*

A. Dimensional tolerances maintained

B. Surface finish improved . . . with possible elimination of additional finishing operation

4 *Simplification of cutting oil requirements*

Mobil Oil Company, Room 2958-A
A Division of Socony Mobil Oil Company, Inc.
150 East 42nd Street, New York 17, N. Y.

Gentlemen: I am interested in learning how new Mobilmet oils can help in my metalworking operation. Please provide further information.

Name _____

Position _____

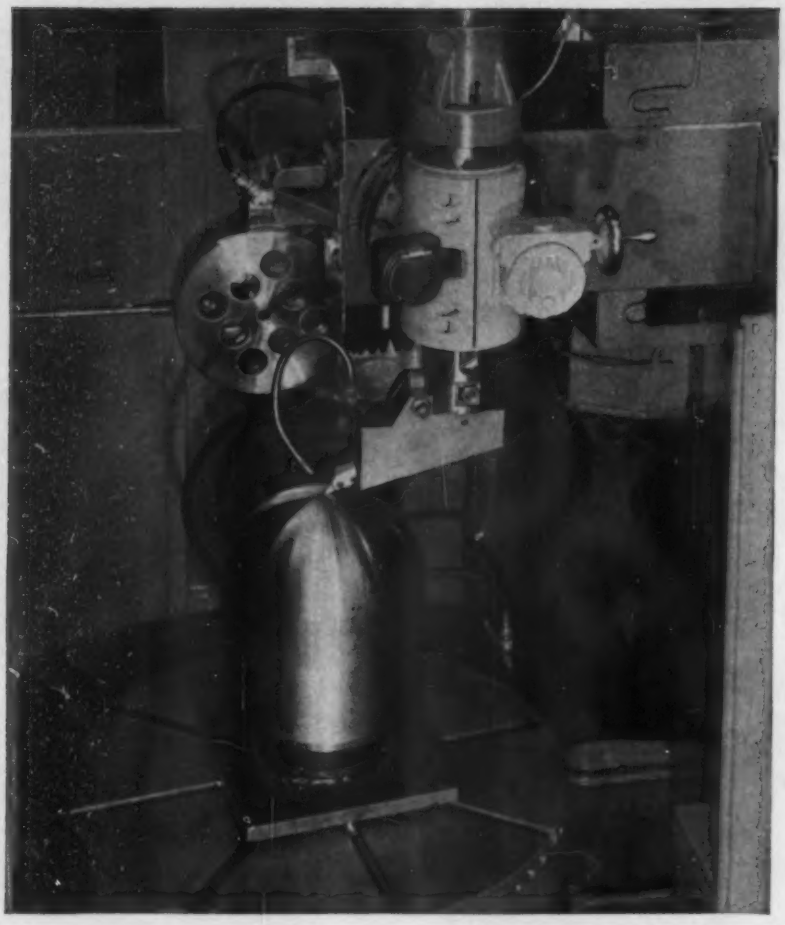
Company _____

Address _____

City _____ *Zone* _____ *State* _____

(Check one): Job Shop _____ *Production* _____ *Combination* _____

CIRCLE 328 READER SERVICE CARD



Super-precise turning, boring and grinding machine— A Frauenthal FIRST!

Countdown on contour turning accuracy...

.000150"

GUARANTEED

...even on 30" diameter work pieces!

The new Frauenthal electrohydraulic tracer control incorporates super-precise recording facilities. Recorded are the accuracy of the follower to the tracer template and the machine slides.

This versatile 900 Series machine has a 30"-diameter table with maximum swing of 36". Maximum vertical slide travel — 32"; maximum vertical travel on manual turret slide — 3".

The custom-built 900 Series achieves critical contour turning accuracies not available in similar machines. The precision-guaranteed 900 Series will hold a tolerance of ± .000150" on contoured surfaces, with tolerances as close as ± 100 millionths possible on straight work pieces.

The 900 Series utilizes vertical design to eliminate the deflection normally encountered when unsupported parts are machined in a horizontal position.

Frauenthal's ultramodern electrohydraulic tracer system affords a new high degree of control reliability. Completely transistorized for compactness, it guides the vertical and horizontal travel simultaneously through 360° of motion. Any variation from true contour path is immediately indicated on a continuous recorder which also gives a permanent record of contour turning accuracy.

A numerical control for continuous path or point-to-point positioning is also available.

Enjoying unusual versatility, the new turning and boring unit anticipates machining needs far into the future. The machine will easily adapt to conventional grinding, turning, boring, milling, facing and polishing.

You can bring your most difficult machining problems to Frauenthal with complete confidence. Contact Frauenthal now.

Versatility of vertical machine design cuts floor-to-floor time • Two-axis tracer system holds stock removal constant per revolution regardless of stylus location on the contour • Cast work table with tee slots is ground flat to surface-plate accuracy to insure precise setup, measuring and installation of fixtures • Exceptionally efficient water-type heat exchanger and variable temperature control regulate the hydraulic system temperature within ± 1° to hold oil viscosity and maintain accurate tracing • Automatic force-feed lubrication • Unit can also be equipped for grinding.

Designed and built in the U.S.A. You get American quality when you buy Frauenthal.

Frauenthal

DIVISION

THE KAYDON ENGINEERING CORP.

MUSKEGON, MICHIGAN, U.S.A.

HERE ARE THE ACTUAL TEST FACTS...
TOOL USED: 4 flute Thriftmill, ½"
MACHINE: Brown & Sharpe Milling Machine

Brown & Sharpe

Thriftmills®

Proved first in Economy and first in General Purpose Performance on TOOL STEEL, IRON, BRASS, ALUMINUM, PLASTICS and FIBER!

RECORD PERFORMANCE
Shop tests show conclusively that the B&S Thriftmill is a revolutionary new tool that can cut efficiently any conventional material and many new, hard-to-mill alloys and synthetics.

RECORD SAVINGS
Despite a price tag 20% lower than conventional end mills, the B&S Thriftmill, because of its extreme versatility, makes many high priced general purpose end mills obsolete.

STEEL

NICKEL CHROMIUM MOLY
A1S1 8620 — **130 Brinell**

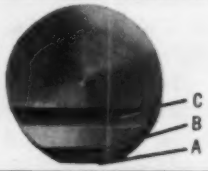
	FEED	SPEED	FINISH
A	4½" min.	530 RPM	EXCELLENT
B	3¼" min.	530 RPM	VERY GOOD
C	2 13/16" min.	530 RPM	GOOD

NICKEL CHROMIUM MOLY
A1S1 E 8650 — **165 Brinell**

	FEED	SPEED	FINISH
A	7/16" min.	530 RPM	EXCELLENT
B	3¼" min.	530 RPM	VERY GOOD
C	2 13/16" min.	530 RPM	VERY GOOD

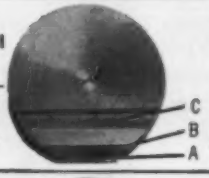
STRAIGHT CARBON TOOL STEEL
A1S1 Type W-1 — **165 Brinell**

	FEED	SPEED	FINISH
A	4½" min.	530 RPM	EXCELLENT
B	3¼" min.	530 RPM	EXCELLENT
C	2 13/16" min.	530 RPM	EXCELLENT



LOW ALLOY TOOL STEEL
A1S1 Type L-6 — **180 Brinell**

	FEED	SPEED	FINISH
A	4½" min.	530 RPM	EXCELLENT
B	3¼" min.	530 RPM	EXCELLENT
C	2 13/16" min.	530 RPM	EXCELLENT



SHOCK-RESISTING TOOL STEEL
A1S1 Type S-1 — **245 Brinell**

	FEED	SPEED	FINISH
A	4½" min.	530 RPM	GOOD
B	3¼" min.	530 RPM	GOOD
C	2 13/16" min.	530 RPM	GOOD

HOT WORK TOOL STEEL TUNGSTEN BASE
A1S1 Type H-13 — **190 Brinell**

	FEED	SPEED	FINISH
A	4½" min.	530 RPM	GOOD
B	3¼" min.	530 RPM	GOOD
C	2 13/16" min.	530 RPM	EXCELLENT

COLD WORK TOOL STEEL
A1S1 Type O-1 — **190 Brinell**

	FEED	SPEED	FINISH
A	4½" min.	670 RPM	GOOD
B	3¼" min.	670 RPM	GOOD
C	2 13/16" min.	670 RPM	EXCELLENT

MEDIUM CARBON STEEL
A1S1 1035 — **170 Brinell**

	FEED	SPEED	FINISH
A	7/16" min.	670 RPM	EXCELLENT
B	3¼" min.	670 RPM	VERY GOOD
C	2 13/16" min.	670 RPM	VERY GOOD

LEADED MEDIUM HARDENABILITY CASE STEEL
A1S1 4150 — **194 Brinell**

	FEED	SPEED	FINISH
A	7/16" min.	530 RPM	EXCELLENT
B	3¼" min.	530 RPM	VERY GOOD
C	2 13/16" min.	530 RPM	VERY GOOD

MEDIUM ALLOY AIR-HARDENING TYPE
A1S1 Type A-2 — **220 Brinell**

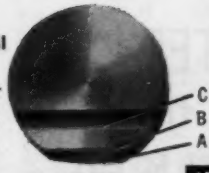
	FEED	SPEED	FINISH
A	4½" min.	530 RPM	EXCELLENT
B	3¼" min.	530 RPM	GOOD
C	2 13/16" min.	530 RPM	GOOD

MEDIUM ALLOY AIR-HARDENING TYPE
A1S1 Type A-2 — **286 Brinell**

	FEED	SPEED	FINISH
A	4½" min.	530 RPM	FAIR
B	3¼" min.	530 RPM	GOOD
C	2 13/16" min.	530 RPM	EXCELLENT

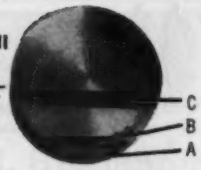
CHROMIUM BEARING STEEL
A1S1 52100 — **170 Brinell**

	FEED	SPEED	FINISH
A	4½" min.	530 RPM	EXCELLENT
B	3¾" min.	530 RPM	EXCELLENT
C	2 13/16" min.	530 RPM	EXCELLENT



FREE CUTTING CARBON STEEL
A1S1 C1141 — **194 Brinell**

	FEED	SPEED	FINISH
A	7⅛" min.	670 RPM	EXCELLENT
B	3¾" min.	670 RPM	VERY GOOD
C	2 13/16" min.	670 RPM	GOOD



IRON

Grey Iron CL-30 — **200 Brinell**

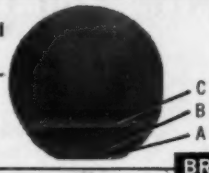
	FEED	SPEED	FINISH
A	16½" min.	800 RPM	GOOD
B	10½" min.	800 RPM	VERY GOOD
C	7⅛" min.	800 RPM	EXCELLENT

Grey Iron CL-40 — **210 Brinell**

	FEED	SPEED	FINISH
A	16½" min.	800 RPM	GOOD
B	10½" min.	800 RPM	GOOD
C	7⅛" min.	800 RPM	EXCELLENT

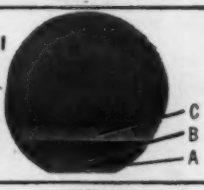
Ductile Iron 60-40-15 — **132 Brinell**

	FEED	SPEED	FINISH
A	16½" min.	800 RPM	GOOD
B	10½" min.	800 RPM	GOOD
C	7⅛" min.	800 RPM	VERY GOOD



Ductile Iron 100-90-02 — **160 Brinell**

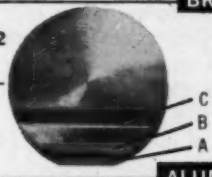
	FEED	SPEED	FINISH
A	16½" min.	800 RPM	EXCELLENT
B	10½" min.	800 RPM	EXCELLENT
C	7⅛" min.	800 RPM	EXCELLENT



BRASS

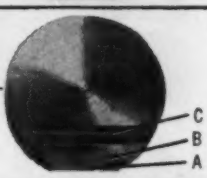
Tobin BRZ — **Alloy 452**

	FEED	SPEED	FINISH
A	16⅛" min.	800 RPM	GOOD
B	13½" min.	800 RPM	GOOD
C	7⅛" min.	800 RPM	EXCELLENT



Brass Alloy 271

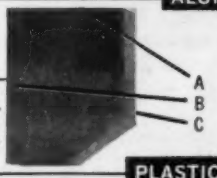
	FEED	SPEED	FINISH
A	16⅛" min.	1240 RPM	EXCELLENT
B	13½" min.	1240 RPM	GOOD
C	7⅛" min.	1240 RPM	FAIR



ALUMINUM

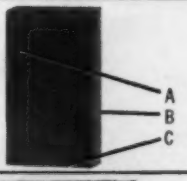
7075 Aluminum

	FEED	SPEED	FINISH
A	60¾" min.	2400 RPM	FAIR
B	16½" min.	2400 RPM	EXCELLENT
C	10½" min.	2400 RPM	SUPER FIN.



2024-T4 — **Aluminum**

	FEED	SPEED	FINISH
A	60" min.	2400 RPM	GOOD
B	30" min.	2400 RPM	GOOD
C	10½" min.	2400 RPM	VERY GOOD



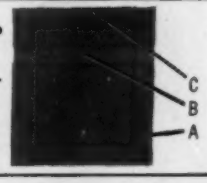
PLASTIC & FIBER

Material — **Linen "L"**

	FEED	SPEED	FINISH
A	150" min.	1000 RPM	VERY GOOD
B	30" min.	1000 RPM	EXCELLENT
C	16½" min.	1000 RPM	GOOD

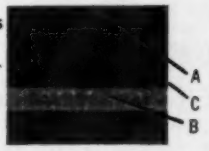
Material — **NAT XXP**

	FEED	SPEED	FINISH
A	150" min.	1000 RPM	VERY GOOD
B	20" min.	1000 RPM	EXCELLENT
C	20" min.	1000 RPM	EXCELLENT



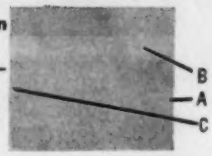
Material — **AA 79 Asbestos**

	FEED	SPEED	FINISH
A	150" min.	1000 RPM	GOOD
B	30" min.	1000 RPM	VERY GOOD
C	15" min.	1000 RPM	EXCELLENT



Material — **Nylon**

	FEED	SPEED	FINISH
A	60" min.	1000 RPM	GOOD
B	30" min.	1000 RPM	VERY GOOD
C	16½" min.	1000 RPM	EXCELLENT



NEW VERSATILITY CUTS GENERAL PURPOSE TOOL INVENTORY . . .

These shop tests and many others indicate that the Thriftmill is not just another end mill. It is an engineering break through in cutting tool design that promises **major, new production** and economy benefits.

ALL THESE BENEFITS AND 20% LOWER INITIAL TOOL COST!

Send for Catalogs and Prices on the complete B&S Cutting Tool Line. Start applying tooling savings and cutting tool performance bonus to your production NOW!

Thriftmills Made in U.S.A.

For that EXTRA Edge in Production!

Brown & Sharpe

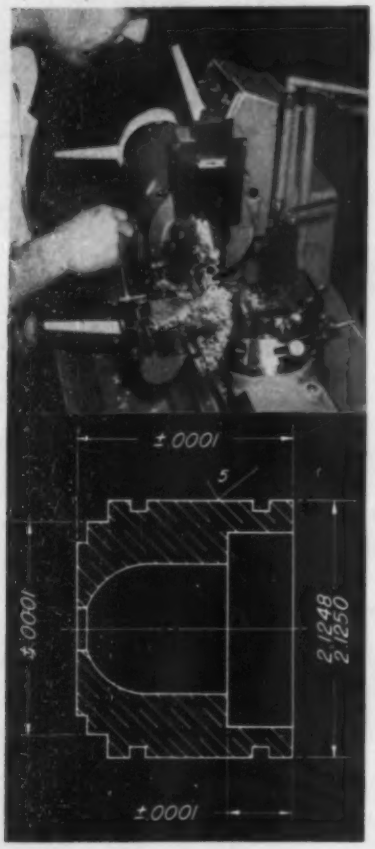
Cutting Tool Division
Brown & Sharpe Mfg. Co.
Providence 1, Rhode Island

✱ '61
BOOTH No. 1315

Wade

model 98 LATHE

Built with 2¼" collet capacity and 9" swing, this electric clutch hand turret lathe releases large machines from bar work and from second-operation work that can be performed more economically on this size lathe. Perfectly suited, for example, to the type of exacting work that is required on a potentiometer case. Distance from spindle to turret face (max.) 17"; spindle speeds 80 to 2000, infinitely variable.



Can your lathe do this?

- Turn to a √5 finish
- Hold concentricity .0002" on 5 or 6 diameters
- Perform 7 distinct operations at one chucking
- Take 2¼" bar stock through the collets

Send today
for descriptive bulletin

THE WADE TOOL CO.
53 River Street
WALTHAM 54, MASS.

LETTER from the PUBLISHER

Are You Listening?

When you and I completed our formal education and received our degrees, no doubt we thought just that: We had **completed** our education. Nothing could have been further from the truth. If you were already well launched on a career in engineering or were managing a metalworking operation when I graduated from college in 1939, carbide tooling was in its infancy, numerical control meant nothing to you and you would probably have laughed at the idea of ceramic tooling. Automation wasn't even a word then. Today, carbide tooling is commonplace, ceramic tooling is over eight years old, automation is the order of the day, and numerical control is fast coming into its own. Just a little over 20 years.

Keeping up . . .

How do you keep up with this rapid change? How do you make sure that you are using the latest, most up-to-date methods and equipment in your shop? By continuing your education. By **reading** the best technical publication you can obtain to keep you abreast of the newest developments.

A suggestion . . .

To get the most out of your reading, you must **listen** with your **mind**; and you'll want that mind to be uncluttered, free to absorb the information that's there. How can you do this? Here's a suggestion. Arrange to have your business paper or technical journal sent to your home. Then set aside an hour or two to read it thoroughly. It will pay off, **if you are listening.**

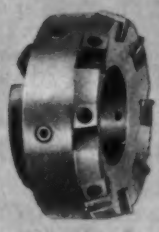
George Reppert

MILLING CUTTERS FROM Super

Every Milling Cutter produced by the Super Tool Company is made of high quality heat treated steel. This assures longer tool life, greater wearing ability and more diversified usage. The carbide tips either brazed or mechanically held assure faster cutting and superior finish for your product.

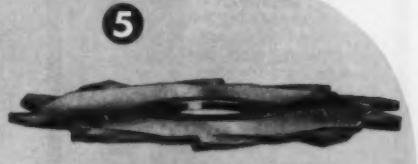
1 IBH FACE MILL — The body of this face mill is designed for general all-purpose milling on any material. The solid Carbide blades are interchangeable for right or left hand bodies.

2 SHELL END MILLS — These End Mills utilize a special body casting and carbide tips, brazed and ground at the right angles for all applications. Super Tool End Mills are job proven through performance in hundreds of leading plants throughout the country.



3 ROTO-BLADE FACE MILLS — Roto-Blade Face Mills feature a new simple, practical design utilizing precision ground throw away inserts. They are built for the most rugged operations and, like the IBH mill, the wedge is placed behind the insert to insure safety for the cutter body. New cutting surfaces are available eight times by indexing and without the need for grinding. The rototeable back-up ring allows for a new insert seat after wearing without further grinding.

4 LIST "DBS"—"DBSS" SHELL END MILLS — These End Mills feature replaceable inserted blades in a shell end mill design. The blades, which are relatively inexpensive, can be purchased separately rather than replacing the entire cutter. The body is made of special steel alloy, heat treated for maximum strength.



5 SLITTING SAWS — These saws are used for cut-off, slotting, and parting of all materials in use today. Each saw is made with a heat treated steel alloy body and straightened to precision tolerances. A full range of styles and sizes of Super Tool saws available from stock.

6 PLAIN AND SIDE MILLS — Super Tool Company has a wide range of cutters designed for the "everyday" job as well as the "impossible" jobs. They are constructed of steel bodies with brazed Carbide cutting edges. These are the "work horses" of every metal cutting plant. They feature heat treated steel bodies and come in a variety of sizes and styles to fit any possible need or application.

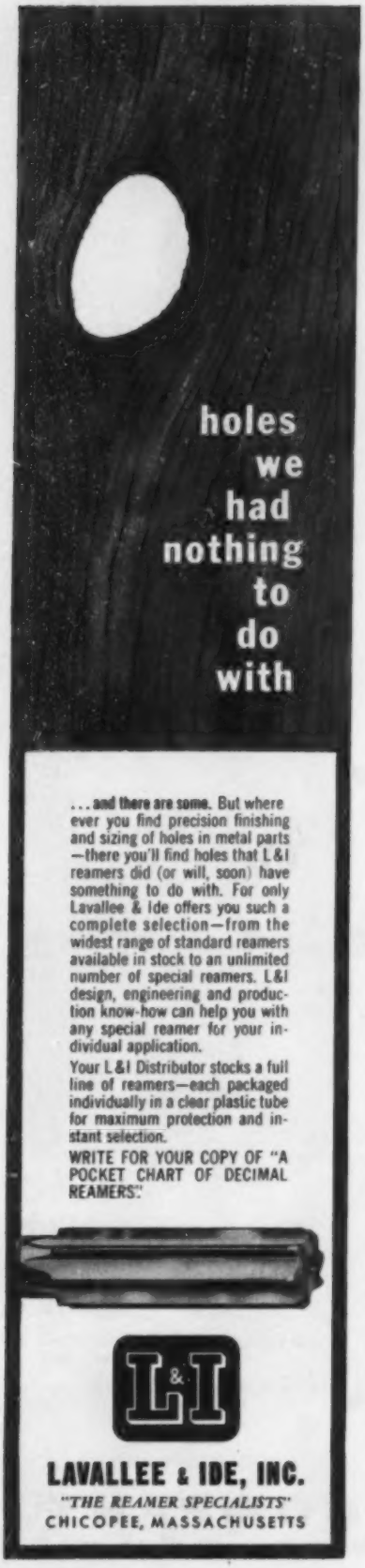
7 BI-AXIAL CUTTERS — These cutters have accurate long-life Carbide cutting teeth for slotting steel. By its combination of angles, the Bi-Axial Cutter will wear on the periphery of the tool rather than on the sides, resulting in longer life and retension of original size.

These tools are available for immediate delivery in a full range of sizes and designs.

Super TOOL COMPANY
Division of Van Norman Ind., Inc.

SUPER TOOL COMPANY

First and Bridge Streets • Elk Rapids, Mich.


holes
we
had
nothing
to
do
with
... and there are some. But wherever you find precision finishing and sizing of holes in metal parts—there you'll find holes that L&I reamers did (or will, soon) have something to do with. For only Lavallee & Ide offers you such a complete selection—from the widest range of standard reamers available in stock to an unlimited number of special reamers. L&I design, engineering and production know-how can help you with any special reamer for your individual application.
Your L&I Distributor stocks a full line of reamers—each packaged individually in a clear plastic tube for maximum protection and instant selection.
WRITE FOR YOUR COPY OF "A POCKET CHART OF DECIMAL REAMERS".
L&I
LAVALLEE & IDE, INC.
"THE REAMER SPECIALISTS"
CHICOPEE, MASSACHUSETTS

LETTERS

to the editors

330 W 42nd St, New York 36, NY

You Can Buy Them, Too

Dear Sirs:

The presentation of quite old and well known foreign technical designs as something new seems to be rather common in the American technical press.

It is surprising that, in this age of great concern with the current technological achievements of the Russians, our technical publications do not do more to become acquainted with the products regularly available from established firms in industrially advanced countries.

It must, for example, be quite astonishing for the 100-year-old firm of Carl Mahr in Esslingen, Germany, to learn (*AM/MM*—Mar 6, '61, p 76) that Minneapolis-Honeywell had to develop a hydraulic mandrel of a type that they have been manufacturing for about 20 years.

These mandrels are available in a number of versions, including an external clamping hydraulic chuck form. Although they are utilized for work holders and cutter arbors, they are primarily intended for mounting gears in precision gear testers. It follows that they are available to tolerances well within the Minneapolis-Honeywell requirements.

More information can, no doubt, be obtained directly from Carl Mahr in Germany or from their U S subsidiary, Mahr Gage, Inc, New York, NY.

T D Sharples, *chief engineer*
Mechanical Design
The Sharples Corporation
Research Laboratories
Bridgeport, Pa

Drawn Burner Wells

Dear Sirs:

In your article on the 1961 stamping awards (*AM/MM*—Mar 20 '61, p126), you note that "... range tops have always been supplied with separate burner bowls ..." and, "... no one has been able to draw wells in a panel without wrinkling the connecting material."

In 1949 our company produced a quantity of four-burner ranges with the burner bowls drawn as an integral part of the top. They were called our Sunbowl Model, and the stampings were produced

SHOPMATES

N. Jarvis

... LET'S USE OUR HEAD!! JUST BECAUSE THERE WAS NO TOLERANCES SHOWN ON THE PRINT IS NO REASON TO HOLD THE WORK TO DEAD NOTHIN'S— THREE DAYS ON THIS THIS PART... THAT'S A LITTLE SILLY— THINK FOR YOUR SELF!
ON THE OTHER HAND ...
YOU TIRED OF YOUR JOB? SINCE WHEN DO YOU GIVE YOURSELF TOLERANCES ?? IS THERE A .00005" PLUS ON THE PRINT? THERE IS NOT— THINK THEY DRAW THESE FOR FUN ??
N. JARVIS

This machine is a technical breakthrough.

This is the essence of precision.

In my opinion, Centalign® bore grinding and race grinding equipment is the finest and most modern single purpose equipment available anywhere in the world today.

No comparable machine available from other sources.

These actual quotations are typical of what people throughout the metalworking industry are saying about Bryant CENTALIGN Internal Grinders. Your nearest Bryant or Ex-Cell-O Sales Representative will be pleased to tell you why.

BRYANT

Chucking Grinder Co.

10 CLINTON STREET, SPRINGFIELD, VERMONT, U. S. A.

Internal Grinders • Special Machinery

VK

VAN KEUREN
GAGE BLOCKS

"Quality in Millionths"

Forty years of experience in manufacturing gage blocks plus the finest in modern measuring instrumentation produce the "Quality in Millionths" evident in VK gage blocks.

These gages are the end product of many skills developed over a long period of time. Final accuracy is controlled by absolute measurement of our master standards on the latest design Zeiss Interferometer and by comparison with masters calibrated by Interferometry at the National Bureau of Standards, Washington, D. C. VK gage block measurements are made in a modern gage laboratory in which temperature is held to 68° ± .1°F. Surface finish is inspected by a Zeiss Interference Microscope.

Van Keuren rectangular gage blocks are offered in Class A ($\pm\frac{.000004"}{.000002"}$) and Class B ($\pm\frac{.000006"}{.000002"}$) accuracy. They are guaranteed for length, flatness, parallelism, surface finish, hardness and stability.

SEND FOR BROCHURE LISTING SIZES, SETS AND PRICES, AND DETAILS OF OUR CALIBRATION AND INSPECTION SERVICE.

THE VAN KEUREN CO.
173 WALTHAM STREET, WATERTOWN 72, MASS.
Telephone WA 4-4394, 4395

PRECISION MEASURING TOOLS
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Plain and Thread Plug and Ring Gages • Measuring Wires • Optical Flats and Light Wave Equipment • Gage Blocks • Precision Lapping Service and Parts

for us by the S B Whistler Co, Buffalo, NY, utilizing their Hydrodynamic Process.

This is not called to your attention to detract in any way from the accomplishment of the tooling personnel at Welbilt, as they are certainly to be commended for their solution to a mighty tough problem.

William J Delp, *master mechanic*
Gibson Refrigerator Division
Hupp Corporation
Greenville, Mich

Nike-Zeus Contractor

Dear Sirs:
We noted on your "Aircraft and Missiles Page" that you list Westinghouse Electric as a major contractor on the Nike-Zeus System (*AM/MM*—Mar 6 '61, p57).

The January issue of "Missile Design and Development" listed Western Electric as the prime contractor, and Westinghouse Electric is listed as a subcontractor of radar components only. We have also found in our contacts that Douglas Aircraft and Western Electric are the prime contractors on this missile and its control system.

Robert C Bevis, *vice president*
Cincinnati Milling and Grinding Machines, Inc
Cincinnati, Ohio

Reader Bevis is correct. We apologize for letting this typographical error slip through—Ed.

"The charges include removing finish, cleaning, rinsing, drying, re-applying finish, polishing and listening to their man tell us how to do it."

AM/MM

CALENDAR

American Society for Quality Control — Annual Convention, May 22-24, Sheraton Hotel, Philadelphia, Pa.

Design Engineering Show, May 22-25, Cobo Hall, Detroit, Mich.

American Society of Tool & Manufacturing Engineers — Tool Show, May 22-26, Coliseum, New York, NY.

American Supply & Machinery Manufacturers Association — Triple Industrial Supply Convention, May 23-25, Atlantic City, NJ.

Canadian Purchasing Conference, May 29-30, Royal York Hotel, Toronto, Ont.

American Gear Manufacturers Association — Annual Convention, June 4-7, The Homestead, Hot Springs, Va.

Society of Automotive Engineers —Summer Meeting, June 4-9, Chase-Park Plaza Hotel, St Louis, Mo.

Society of the Plastics Industry— National Plastics Exposition and Conference, June 5-9, Coliseum and Commodore Hotel New York, NY.

Instrument Society of America— Instrument-Automation Conference & Exhibit, June 6-8, Royal York Hotel and Queen Elizabeth Hall, Toronto, Ont.

Drop Forging Association — Annual Meeting, June 14-17, The Greenbrier, White Sulphur Springs, W Va.

National Association of Metal Finishers—Annual Convention, June 16-19, Statler Hilton Hotel, Boston, Mass.

American Society for Testing Materials — Annual Meeting, June 25-30, Chalfonte-Haddon Hall, Atlantic City, NJ.

Joint Automatic-Control Conference, June 28-30, University of Colorado, Boulder, Colo.

Society of Automotive Engineers —Farm, Construction, and Industrial Machinery Meeting, Sept 11-15, Milwaukee Auditorium, Milwaukee, Wis.

MODERNIZATION WITH A PURPOSE

(A Production Tip from Bijur)

Through the years, you have probably seen Bijur Automatic Metered Lubrication become standard equipment on the machines you purchase. The reason is, machine manufacturers have found that the increased production, extended machine life, and reduced operating costs that Bijur provides, save their customers money.

You *know* Bijur is available on most new equipment. But did you know that your present standard machines could contribute to higher production if they were Bijur-equipped? This proven system could be saving you money right now.

The installation of Bijur systems requires very little time and, like the system itself, is surprisingly inexpensive.

Write today for additional information on how Bijur can be added where needed.

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Pioneers in Automatic Lubrication

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CIRCLE 338 READER SERVICE CARD

Rheem Electronics
NUMERICAL POSITIONING CONTROLS

Reduce lead time ■ Improve product quality ■ Eliminate expensive jigs and fixtures ■ Increase machine productivity Reduce scrap loss ■ Make small lots economical ■

VERSATILE!

one system fits many machines offers savings in operator training, planning, maintenance

Rheem Numerical Positioning Controls may be applied to almost all machine positioning requirements.

Construction is modular, by axes.

Different resolutions are available.

Automatic, semi-automatic, or manual operation modes are available.

Decimal display of tape information is provided.

Positioning speeds are high . . . limited by resolution only.

Feed rate control is available.

Travel distances are large.

Controls from 1 to 6 axes.

Electronic distribution.

Manual input of dimensional information and decimal display available at no extra cost.

Let versatile Rheem Electronics Numerical Positioning Controls start saving you money. Write TODAY!

TYPICAL TWO-AXIS RHEEM NUMERICAL POSITIONING CONTROLS CONSOLE. THIRD AXIS AVAILABLE AT LOW COST.

RHEEM Position Display

POSITION DISPLAY

Designed to meet the requirements of operator controlled machines including retrofit on existing machines . . . provides a continuous display of machine position in decimal form . . . used in conjunction with a position transducer to detect machine slide displacement in increments of either .001 or .0001 inches . . . offers selection of absolute position from a zero reference point continuously displayed, or the incremental distance between two coordinate positions . . . allows the operator to position the machine more rapidly and with greater accuracy . . . a compact unit occupying less than one cubic foot of space per axis.

RHEEM NUMERICAL CONTROL shown with Burgmaster 25AHT turret drilling machine

RHEEM NUMERICAL CONTROL pictured with Excello Model 750 Numera-trol boring machine

Rheem electronics

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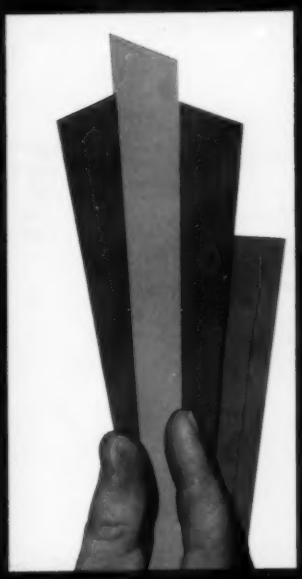
Los Angeles 45, Calif. SPring 6-1800

A division of Rheem Manufacturing Company

BESLY-WELLES

TAKES THE MYSTERY AND MISTAKES OUT OF TAP SELECTION

IF YOU KNOW THE MATERIAL TO BE TAPPED . . .



AND THESE FOUR COLORS . . .

SELECTING THE RIGHT TAP IS FAST AND ALMOST AUTOMATIC!

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South Beloit, Illinois, U.S.A.

BESLY-WELLES COLOR CODE DOES THE TRICK . . . HERE'S HOW

BESLY-WELLES COLOR CODE MAKES TAP SELECTION AS EASY AS 1 2 3

CHECK THE COLOR-CODED, QUICK-REFERENCE TAP CHART

It identifies the tap you need according to the job you need done!

There's nothing to it! In the left-hand column on the chart you find the material to be tapped. Then you look directly across each color-coded column until you find a "+" sign. Look at the heading of that column and you've got the **kind** of tap that's best for the job. Doesn't take more than a few seconds. For the **exact** tap, TAKE STEP 2 . . .

FIND THE EXACT TAP IN THE COLOR-CODED BESLY-WELLES TAP SELECTION BOOK

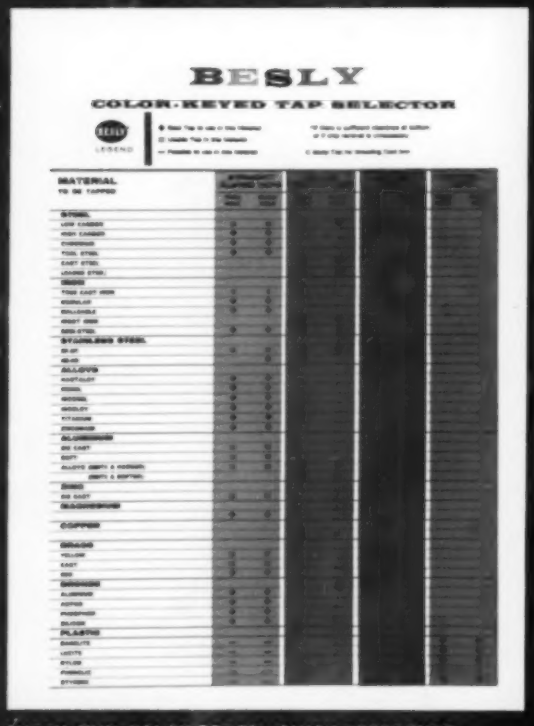
The exact size, pitch, pitch diameter tolerance and catalog number are right at your fingertips!

All the details are cataloged in the Besly-Welles Tap Selector Book. And it's color-coded, too, so there's no chance of confusion. The chart tells you the **kind** of tap you need . . . the book locates the **exact** size, pitch and pitch diameter tolerance, and gives you the catalog number to use. Just about as easy as finding a 'phone number.

ORDER WITHOUT MYSTERY OR MISTAKES

75% of all tap applications are solved right here . . . for special problems, contact your Besly-Welles man!

That's right, nearly all standard tap needs you face day after day are covered in the new Besly-Welles tap selector. And that's no idle claim. Months of study and work have gone into its preparation. Its been checked against the tap needs of users all over the nation and in every industry. But we can't cover them all, of course. So if you don't find the answer in your Besly-Welles book, call us, our tap specialists will be pleased to work it out with you.


BESLY
COLOR-KEYED TAP SELECTOR
MATERIAL TO BE TAPPED

CHECK THE COLOR-CODED, QUICK-REFERENCE TAP CHART

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SOUTH BELOIT, ILLINOIS

SPOT NEWS...

- **New White House Committee on Small Business will establish policies** and programs on behalf of small concerns. President Kennedy has named John E Horne, presently administrator of the Small Business Administration, as chairman. The President has asked Horne for progress reports on the effectiveness of the order to increase small business's share of government procurement contracts, and has asked for further suggestions to implement the order.

- **Eddy current techniques are now being used to inspect ferromagnetic tubing** and bar, says John W Allen, Budd Co. Until now this has been difficult because permeability variations in ferromagnetic materials created signal differentials greater than those caused by flaws. The solution: Introduce DC saturation to offset signal variation arising from permeability variations.

- **Auto industry's use of iron-base powdered metals increased 300% since 1954** and will increase an additional 100% in the next five years, according to W P Balthrop, president of Chrysler Corp's Amplex Division. The average 1961 Chrysler Corp car uses up to 103 different powdered metal parts, he said.

- **Fiat is planning to build the largest auto plant in the Middle East,** according to reports from Italy. To be located near Cairo, the plant will produce 10,000 Fiat-1100 Specials a year. The United Arab Republic has also acquired a license to assemble Fiat's 600, 1800, 2100, and Campagnola autos.

- **TWA will acquire 30 Boeing 707 jets through a $187-million lease-purchase** order that calls for delivery by late fall 1962. TWA will have four of the planes by this September. Boeing, by the way, is now officially known as the Boeing Co. The word "airplane" was dropped at the recent stockholders meeting.

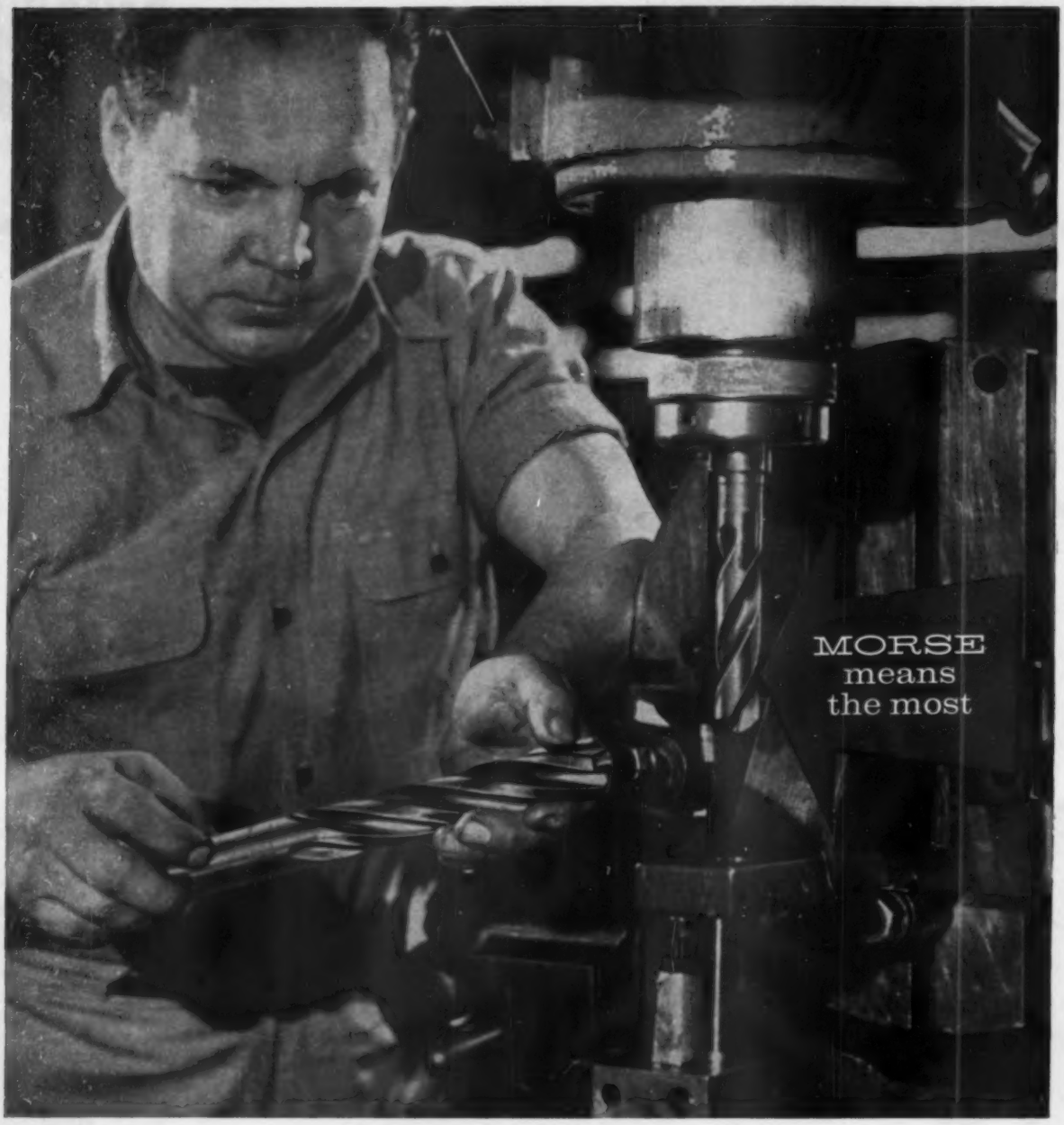
- **Gun rifling by numerical control at Watervliet (NY) Arsenal** is saving a considerable amount of time. The method also provides a tremendous flexibility in developing prototype helixes. The single-axis motion is programmed on magnetic tape which is the same length as the barrel being rifled. Then the rotation of the barrel is coordinated with the advance of the rifling tool so that any desired twist can be produced. A further advantage is the Arsenal's ability to program complex rifling on a computer.

- **U S firms were pushing export items at this year's U S World Trade Fair,** with the backing of the U S Department of Commerce. This is a switch in that the Fair (May 3-13, New York) is primarily a showplace for foreign goods. Among the 35 American companies exhibiting were Yale & Towne, Hyster, Detecto, Sherwin Williams, Industrial Timer Corp, Thomas & Betts, and AMF.

- **United Technology Corp will design and build a 250,000-lb-thrust rocket** for NASA. Contract calls for design, building, and testing of the conical, segmented, solid-fueled rocket—a rocket described as the "initial step in the development of a family of low-cost boosters." Clusters of such rockets, says United, could produce over 15 million pounds of thrust.

- **License to produce an asbestos-reinforced phenolic plastic auto muffler** will go to a Cleveland firm, says Curt A Knoppel, president of Proman, Inc, Akron, developer of the new muffler. Process can turn out a muffler about every 15 seconds. No decision has been made on whether to sell the muffler as original equipment or to the replacement market.

with men who know cutting tools... it's MORSE everytime



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WASHINGTON...

The big tax fight . . .

Even before buyers and sellers of machine tools and other production equipment came to Washington to testify on the Administration's tax credit proposal, its chances of passage were growing dimmer.

There's no doubt that Congress would like to go along with some proposal to stimulate business spending on plant and equipment, but the Kennedy tax program is so complex it will be difficult for the Congressmen to handle.

Secretary Dillon's "detailed explanation" of the Kennedy tax credit didn't add much in the way of information or explanation. Mainly it provided tables and statistics to show what its effect would be if adopted. Certainly Dillon's reception by the Ways and Means Committee was lukewarm.

Much closer to reflecting the feeling of Congress, probably, is the report of the Joint Economic Committee of Congress, after the Committee heard the Council of Economic Advisors, Treasury Department, Labor Department, Commerce Department and others explaining and arguing for Kennedy's programs.

The Democratic majority of the Committee—which favors Kennedy's programs generally but wants him to do more—is skeptical of the tax credit.

"It may be that a tax incentive . . . will have relatively little stimulus to investment unless final consumer demand is stimulated . . . It may be that alternative tax reduction to stimulate consumer demand might, in the long run, do more to induce the desired expansion of capital."

This is closer to the Walter Reuther line, but it is also an argument that carries more weight in Congress than is generally realized.

The Joint Economic Committee tosses up some technical arguments against the tax credit idea: It may tend to accentuate business fluctuations, and stimulate spending on plant and equipment during business booms, when such spending would increase without an incentive.

They consider it just one of a number of alternative tax ideas which should be considered to help both short-run business conditions and long-term growth.

The Republicans disagree . . .

The GOP members of the Joint Economic Committee attack the premises and conclusions of the Democrats. They say that the economy isn't really in bad shape, that the business upturn is here and doesn't need much more help, that unemployment is mainly structural, and that the whole theory of the "gap in our growth" is "dangerous to the welfare of our country."

The Republican minority took no stand on the issue of the tax credit or on incentives for plant and equipment spending. But Senator Jacob Javits (R—NY) found the incentive proposal "most desirable . . . but . . . inadequate."

Raising the money . . .

The tax-raising portions of the Administration's tax proposals are designed, among other things, to end the preferential tax treatment of profits earned by subsidiaries of U S corporations in industrialized countries.

The idea is to make the U S shareholder (company or individual) pay the tax on such earnings just as though the profits of the subsidiary had actually been paid out currently to the owners.

The theory is that the competitive industrialized countries no longer need the encouragement of the U S tax laws passed when our object was to stimulate their post-war recovery. Hence, such preferential treatment would be retained now only for the so-called developing countries.

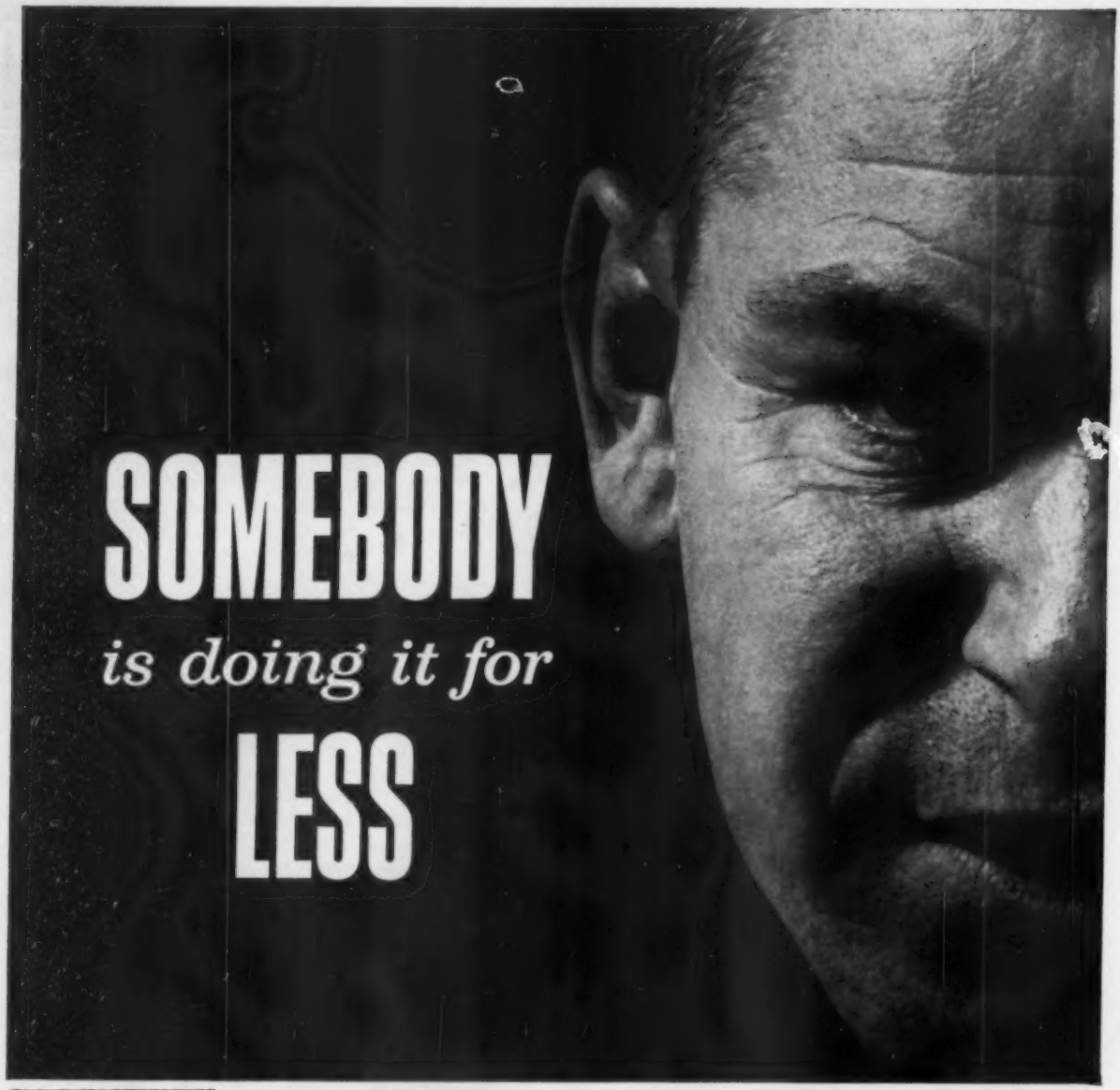
Dillon also explained how the Administration would clamp down on income that avoids taxation by being tucked away in "tax haven" countries such as Switzerland and Panama. One way: making American shareholders of such tax-haven corporations pay the tax currently on specified kinds of income—for instance, profits and commissions on sales outside the country, fees for engineering and other services performed outside the country, rentals and royalties earned outside the country.

Firms trying to make themselves look like bona-fide manufacturing companies to avoid the tax-haven law would be required to show that the cost of production of their output exceeds 25% of the cost of the raw materials or components that go into the final product.

One of the hottest issues, and one that will help cool enthusiasm for Kennedy's proposals, is dividend withholding.

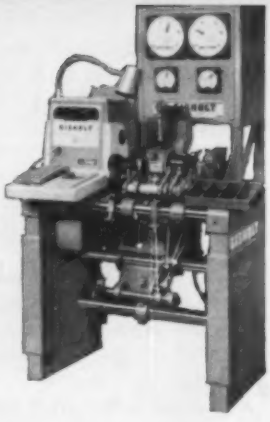
Here's how it would work: A corporation paying a dividend of, say, $1 million (or a bank paying out the same amount of interest) would send 20% of this, or $200,000 direct to the Internal Revenue Service.

The dividend receiver who is entitled to a check for $1000 would get only $800. When he files his income tax return each year, he would count $1000 as dividend income, and but then subtract from his final tax bill the $200 that was sent in.



Gisholt MASTERLINE® 1S Balancer—Shown with separate unbalance location (angle) and amount meters for each correction plane. Readings hold until corrections are made. Offers complete plane separation—needs no special foundation—correction planes can be inside or outside work supports.

New HS line handles miniature, high-speed parts—impellers, armatures, gyros, self-driven assemblies.



Contact your Gisholt Representative, or write for Catalog 1109D.

How long since you analyzed your balancing methods in light of recent developments?

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DETROIT...

Cost of recession . . .

Despite glowing reports of sales increases, which are inevitably based on the previous period that offers the most drastic comparison, a realistic look at production figures shows that 1961 at best will be a 5,300,000-car year including imports.

A few examples for the four months through April, taken from the manufacturers' own production reports: 398,716 standard-size Chevrolets were made compared to 658,903 in the same period last year; the combined total of Pontiacs and Tempests is 112,670 units, compared to 171,-211 standard Pontiacs last year; Dodge, including the newly added Lancer, has produced less than half as many cars as last year; Chrysler as a whole through April had an output of 190,516 cars and trucks, compared to 436,681 last year; and at Ford, only Comets and tractors are showing a slight edge over last year.

So actually the glowing press releases that tell of 30 to 40% sales increases are based on a percentage of a previous sales pace that amounts to little more than the annual scrappage rate.

Tempest in a can . . .

This week Williams Research Corp will announce that its tiny but mighty WR 2-1 Turbojet engine (*AM/MM*—Apr 17, p99) is ready for production and available for experimental application.

It has been uprated from 70 to 85 pounds thrust with no increase in its 23-pound weight, or its size, which is about the same as a deformed gallon jug of cider. It is by far the smallest package of mechanical dynamite in existence today, because at Mach 1, 85 pounds of thrust is approximately equivalent to 170 horsepower.

The turbine and compressor represent a significant breakthrough in that their rings and blades are one-piece castings formed from a readily available cobalt-base alloy. Elongation and plastic flow of the castings is prevented by introducing compressive stresses in the machine weld connecting the ring to the hub.

Williams Research President Sam B Williams claims that one of these precision castings costs only $80 in prototype quantity, and any significant volume would lower the cost to about $10. The usual "fir tree" type blades and rings cost at least 10 times that to manufacture, and are generally made from less commonly available metals.

Other than Williams Research, only Chrysler Corp has succeeded in designing cast blade rings. And at the time, Mr Williams was project engineer on the Chrysler turbine program. Chrysler uses a cheaper iron alloy, rather than a cobalt alloy, for its castings.

Combustion chamber of the Williams engine is annular, and it handles an air-flow of 1.75 pounds per second. He estimates that the unit will consume about one pound of fuel per hour at rated power, a state where the mighty mite is shrieking away at 59,000 revolutions per minute.

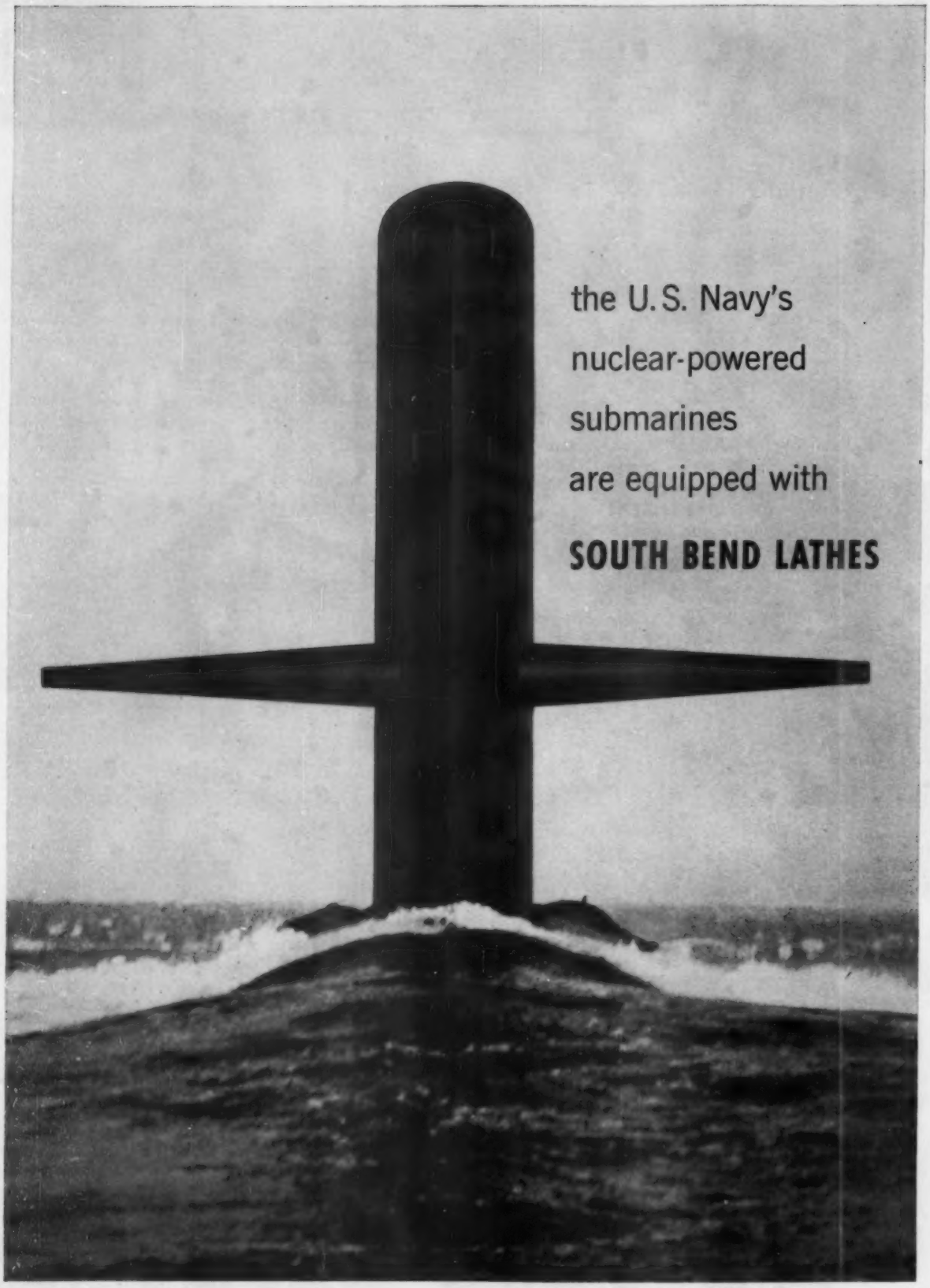
The compressor housing assembly consists of three simple aluminum castings. The hot section is a vacuum-brazed assembly of 18-8 stainless sheet that has no difficulty withstanding the 1330F exhaust temperature. Common aircraft-turbine technique is to hand-weld this compressor housing assembly.

When the Williams turbine is used for vehicle, marine, or stationary applications a free-shaft power turbine is added and, in some instances, a rotating heat exchanger. Again, Williams developed the latter item when he was a Chrysler engineer, and without it no turbine can hope to compete with piston-engine fuel economy.

At peak engine speed, the Williams heat exchanger is rotating at about 60 rpm. It consists of many layers of crimped stainless steel wound on a hub much like a roll of tape. The steel is about the thickness of this magazine page, but the crimping produces air passages of 6 to 8 times larger. Cold incoming air passes through about one-third of the area, where it is heated by the exhaust gases passing through the other two-thirds.

The WR-2-1 turbojet does not use an exchanger because it was specifically designed for aircraft use. Most likely application will be to power a new generation of tiny, 700-mph drones for anti-aircraft practice.

Williams envisions other applications such as a standby power-plant for sailplanes and use as a helicopter rotor-tip propulsion engine. The shafted version is already being installed in a Mutt (Ford's ¼-ton Military Utility Tactical Truck) on an Army contract, and it is also expected to appeal to prestige conscious buyers of deluxe small cars, where individuality rather than cost is the motivation.—**Don MacDonald**



Official U.S. Navy Photograph

AIRCRAFT and MISSILES... TRENDS

Aircraft shopping list...

The Army has spelled out a $211-million schedule for new aircraft orders in fiscal 1962 (beginning July 1). New procurement will cover 242 Bell Iroquois helicopters, totalling $67.6 million; 24 Vertol Chinook transport helicopters, $35.4 million; 48 Grumman Mohawk surveillance airplanes, $42.8 million; 48 De-Havilland Caribou STOL transports, $30.2 million; and 14 Beech Seminole transports, $1.8 million.

At least $33 million worth of spare parts and installation kits is also included in the order.

New orders for the Air Force break down this way, according to current plans: 72 Boeing KC-135 jet tanker planes, $185.7 million; 192 Republic F-105 fighter-bombers, $369.9 million; 144 Northrop T-38 trainer aircraft, $128.9 million; 55 North American T-39 trainers, $50.3 million; and 10 Lockheed T-40 support-type planes, $19.1 million.

These lists, which have just been submitted to Congress, are not necessarily complete and are likely to be expanded.

AF needs new light plane...

The Air Force plans to buy 29 light STOL planes this year and an additional 47 next year to provide air transportation between dispersed ICBM sites.

Aircraft makers have already submitted proposals. The plane the Air Force wants must carry a payload of a pilot and four passengers, a pilot and one litter patient, or a pilot and 800 lbs of cargo. It must also be able to fly in and out of tiny, improvised landing sites adjacent to missile sites.

Republic's new R&D center...

Republic Aviation Corp's new $14-million Paul Moore Research and Development Center in Farmingdale, NY, already has design groups working on plans for manned vehicles ranging from aircraft that can travel at twenty times the speed of sound to lunar reconnaissance spaceships.

The Center, named in memory of one of the founders of Republic Aviation, is built around a complex of seven advanced research laboratories and supported by a trio of wind tunnels. The names of the laboratories will give you an idea of the activities going on —Space Environment and Life Sciences Re-entry Simulation, Materials Development, Nuclear Radiation, Guidance and Control Systems, Fluid Systems, and Electronics.

According to William J O'Donnell, chief engineer for applied research and development, the fundamental role of each laboratory is to support corporate-wide activity in two fields of research simultaneously: in aeronautics and astronautics.

Defense review continues . . .

The recent military budget revisions were just the first round in what's likely to be a full-scale overhaul of the defense program by the Kennedy administration. The tip-off comes from an order by Defense Secretary McNamara for 121 formal staff studies on just about every serious defense problem on the books. McNamara had a penchant at Ford Motor Co. for making surveys to help on key decisions. He's carrying the habit on in the Pentagon.

The subjects range over many fields of direct interest to defense contractors—in terms of future production schedules, procurement policy, and the like.

On orders from McNamara, for instance, Air Force Secretary Zuckert is reviewing a plan to replace still more scheduled Titan II output with additional Minuteman ICBMs and to slash F-105 aircraft output (assuming work on the new plane design can be rushed).

Navy Secretary Connally is studying whether additional aircraft carrier construction should be approved or whether development of the A-2 Polaris version (1500 miles) should be cancelled. Defense R&E Director York will report on the potential of manned strategic systems other than the B-70 bomber and will reassess the Skybolt missile project and the over-all anti-ICBM program.

Defense Comptroller Hitch is working up guidelines for the 1962-63 fiscal budget and a five-year projection of defense spending. Assistant Secretary Morris is preparing a year-by-year forecast of the impact of aircraft and missile projects on regional employment, studying a plan to pay special premiums to production contractors for performance, and reviewing policy on inventory stock levels and reorder of major operational hardware items.

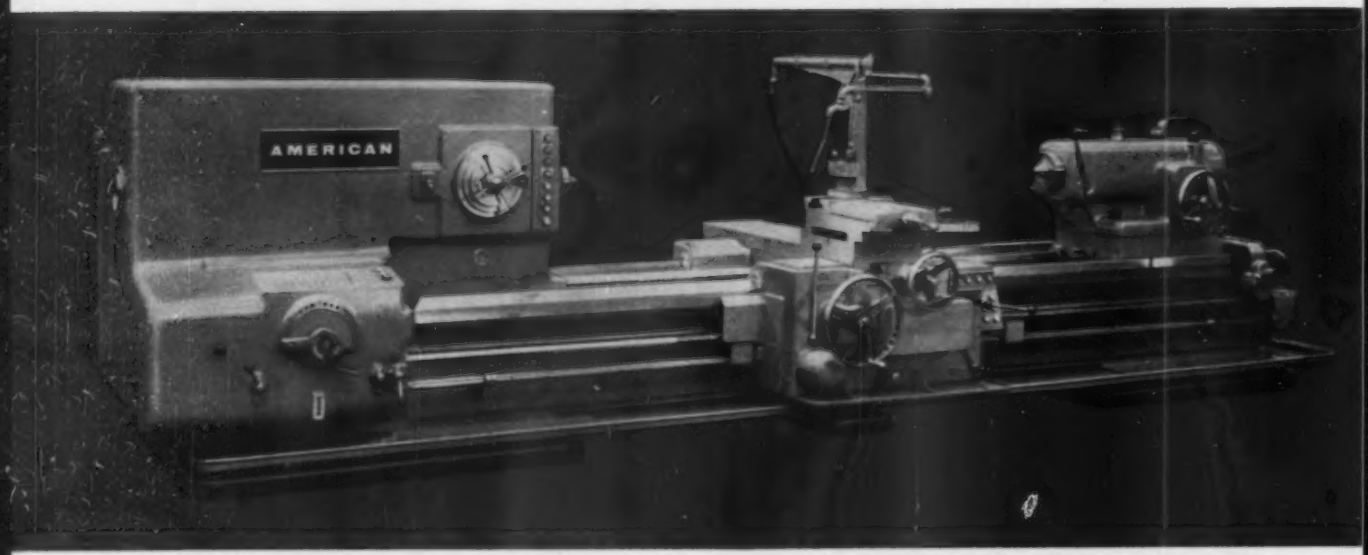
Defense General Counsel Vance is studying a plan to merge the Army's technical services—Ordnance, Quartermaster, and Signal Corps—into a single contracting command.

Some of the studies have already been completed, and show up in the recent budget changes. The other surveys are due regularly from here on out through the early fall and will be reflected in upcoming Pentagon decisions.

TALK ABOUT ABILITY!

This husky boasts a 100 hp main drive motor and spindle speed range of 6 to 750 rpm. Its massive 7½" tailstock spindle offers big load capacity. Pre-selective hydraulic powershift and push button control of cross and longitudinal feeds keep this giant under fingertip control. 48 spindle speeds provide any surface speed with a deviation of less than 6% from that actually required for the chosen diameter. The operator, after setting the correct surface speed, merely dials the work diameter. The computing dials then automatically produce the correct rpm for each diameter. Or . . . the operator may choose rpm directly if he wishes. Write for Bulletin 913-A.

100 HORSEPOWER AMERICAN 40" STYLE J-100 PRE-SELECT ENGINE LATHE



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MACHINE TOOLS...

World study of machine tools . . .

West Germany and the United States far outranked other suppliers to the world machine tool market, with 31% and 28% respectively, during the four-year period 1955 through 1958. United Kingdom was third (12%) and Switzerland fourth (9%).

This is one of many important facts turned up by comparable statistics on world exports and imports of several types of machine tools put together for the first time by the Metalworking Equipment Division, Business and Defense Services Administration, Department of Commerce.

West Germany's machine tool shipments rose from $128 million in 1955 to $199 million in 1958, according to the study. Other highlights:

1) Trade in machine tools by principal countries rose by 40% in the five-year period, far exceeding the 13% increase in all trade.

2) Exports of forming-type machines gained 54% compared with only 35% for cutting-type machines.

3) Forming tools other than presses rose 69% or $51 million, as probably the most noteworthy development of all. They represented one-third of the increase in total value of world exports of machine tools during the entire period.

4) Grinding machines made the largest percentage gain in exports next to forming tools other than presses.

5) Exports of lathes and gear-cutting machines declined substantially in relation to the market as a whole.

More than half the machine tools exported were delivered to customers in the exporting countries themselves, including the Communist-bloc nations.

Brazil and India big markets . . .

Brazil's imports increased five times during the 1955-1959 years, and India's almost tripled.

U S imports of machine tools went up almost 60%, from $15 million to $23 million. But they were less than 5% of the world total in each of the years.

Three countries—France, Britain and Japan— took almost one-fourth of world imports of cutting-type machines.

Exports of American forming-type machines grew steadily, with shipments representing 44% of total U S machine tool exports in 1959 compared with 30% in 1955. By contrast, cutting-type machine exports dropped 6%.

For further details of this export-import machine tool study, please turn to page 133.

Japan is hot market . . .

Japan is being called the world's hottest machine tool market. Growth rate of the Japanese economy in fiscal year that began April 1 is put at 9%.

Capital plant expansion the next 12 months is estimated at $1 billion or more.

About $100 million of Japan's foreign exchange budget for the first six months of the current fiscal year is said to be earmarked for machine tool imports.

European builders, especially the Swiss, were out in force showing machines at the recent Tokyo International Trade Fair. Licensing of Japanese builders to make Italian, German and French machine tools is much talked about.

Some U S builders recently in Japan are reported keenly interested in the possibility of similar licensing agreements.

At least one well-known Japanese builder is eager to enter into a reciprocal agreement whereby his plant will produce U S machines under license and the U S builder will sell Japanese-made machine tools in this country.

Mitsubishi has orders from West Europe and Britain for three giant Innocenti-designed combination milling and boring machines. It has a backlog of 32 machines, builds five a month.

Japanese machine tool builders have hefty order books, some of them extending up to two years.

The Japanese machine tool industry has grown so much that it is reported to have surpassed Switzerland in value of its products and now is in sixth place in the world.

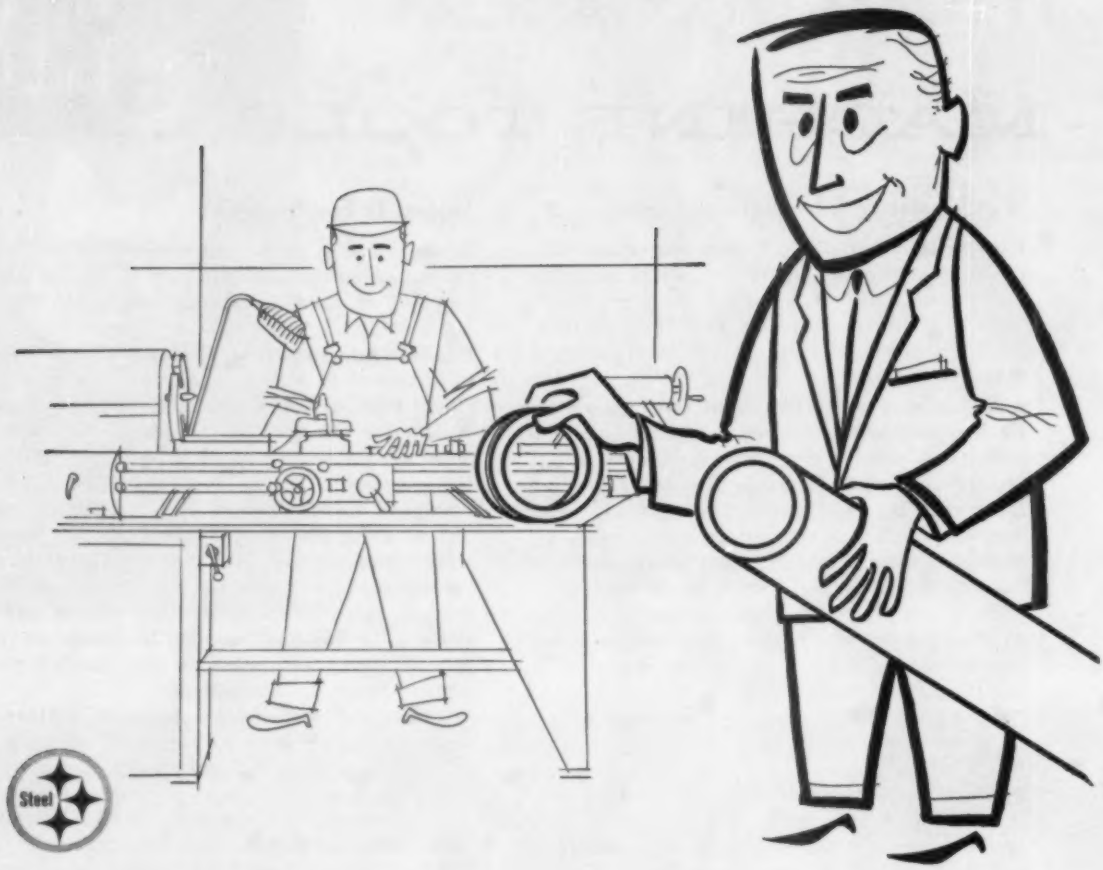
With the exception of 30 items, all restrictions on importation of machine tools will be lifted by the end of 1962.

Renault licenses Indian firm . . .

Indian government's Hindustan Machine Tools factory at Bangalore has made an agreement with Renault of France and Limex of East Germany whereby it will have the right to make under its own name a variety of machine tools now produced by Renault and Limex. It also will have the non-exclusive marketing rights in neighboring countries.

Renault unit heads, turntables, handling units, transfer line bases and certain items for transfer components are among the products that Hindustan will make. Renault will supply each year during the seven-year agreement machine tools ordered by Hindustan.

BF



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when you specify B&W Job-Matched Mechanical Tubing

Do you consider tubing as a semi-finished product? It can be. In fact, when you start with the right B&W tube many end products require only finish machining—others need no machining at all.

Here's why. B&W seamless mechanical tubing is job-matched to your end-use application and production equipment. Desired finish, heat treatment, tolerances, alloy factor and steel quality are built into the tube to bring it as close as possible to the finished part. What's more, properties are uniform from tube to tube. You get fewer rejects —a more machinable tube in high-speed machining operations.

Interested? B&W mechanical tubing is available from Steel Service Centers around the country and through your B&W District Sales Office. Or write for Bulletin T-430. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pennsylvania.

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Seamless and welded tubular products, solid extrusions, rolled rings, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals

MATERIALS...

Cobalt developments . . .

Rex 49 is a new grade of cobalt containing high-speed steel. Designed to provide greatly increased tool life in machining hard-to-cut metals, it can be heat treated to Rc 67-69.

Alnico 7C, developed by Thomas & Skinner, is said to be twice as good as Alnico 5. It has a coercive strength in excess of 1300 oersteds, energy levels above four million gauss-oersteds, and has a slightly higher density than Alnico 5. A 50% reduction in length-to-area ratio permits construction of extremely flat (short) magnetic structures and devices.

A new nickel, cobalt, chromium, molybdenum, and iron alloy, called Haynes Alloy No. 56, resists oxidation at temperatures up to 1900 F. Specimens under continuous exposure to dry air for 100 hours at this temperature showed an oxidation rate of only 0.024 inch per year. A solid-solution type, the alloy possesses good thermal stability.

Improved chemical plating at lower temperatures (about 115 F) is made possible by using borohydrides. Of special advantage in plating thermoplastics, the borohydrides plate cobalt and nickel best. They are excellent reducing agents.

For the 60Cr-18Fe-13Mo alloys, hardness and creep properties are improved by addition of 10 to 15% cobalt. The alloy can be hot worked at 2200 F according to Japanese researchers—who report good oxidation resistance.

Air-lubricated bearings . . .

A substantial breakthrough in the development of air-lubricated bearings is reported by Chrysler Corporation's Missile Division. A Chrysler spokesman said the bearings can be manufactured for as little as 10% of the cost of air-lubricated bearings now in service. These bearings, primarily for military-and space-vehicle use, but also used in industry, traditionally require costly machining to extremely close tolerances.

One bearing, the hydrodynamic or rotating-cylinder type, mechanically generates its own lubricating film of air in the form of a wedge. An offset design of the bearing journal, involving a split housing, provides the wedge effect. Machining and assembly are greatly simplified.

Another bearing is hydrostatic; made from a porous sintered-metal powder through which air is forced—to form the lubricating film. The sintered-metal bearing is made with 15 to 50% voids depending upon the load the bearing is designed to carry. Either the shaft or the journal, whichever is stationary, can be porous. Control of porosity is no longer a problem.

Reduction of noise aboard submarines is another military job Chrysler engineers believe practical for these bearings. Sound tests are encouraging. Low-cost air-lubricated bearings might also be used in civilian applications such as high-speed machine tools, or furnace conveyors which cannot use conventional lubricants. Enormous loads can be carried by these bearings.

Heat-treated structural steel . . .

To provide the designer and fabricator with a complete range of products in the new quenched and tempered steels, U S Steel Corp has a top-priority research project under way. The study is aimed at developing a process for quenching and tempering structural shapes. Straightening of heat-treated shapes is a complex problem.

Heat-treating facilities have been designed especially to prevent distortion during quenching. Early trials are promising and engineers anticipate being able to offer heat-treated structural shapes of higher strength than are presently available.

Quenched and tempered sheets of USS "T-1" type A steel, in thicknesses down to 0.100 inch and widths up to 60 inches, also are expected from methods now being developed. Despite their high strength, these sheets can be formed and welded.

Aluminum wheels next?

An integral casting combining wheel, hub, and brake drum may be the next major aluminum application in automobiles. Kaiser automotive development engineers, in cooperation with the auto companies, have tested the feasibility and strength of prototype wheels.

Available as optional equipment on 1960 Pontiac cars, a Kaiser-developed aluminum wheel produced by Kelsey-Hayes Company is offered on the same basis for 1961 models. Some truck models have standardized on aluminum wheels already.

Cost still is a problem. However, the volume production achieved by wider acceptance of the new material and wheel design could bring the price down to only $10 to $12 higher per car than present standard steel wheels.

dependable

Logan / 14" LATHES

How is a lathe's dependability measured? One criterion is the lathe's productive life-span. And this life-span is largely determined by the lathe's quality of design and construction. The Logan lathe bed is an example. It withstands the heaviest bending and torsional stresses. A special alloy and thorough seasoning (before and between machining) insure a warp-free bed. Also, the two V-ways and flat ways are precision ground. You can depend on Logan's low operating cost, too. The 14" swing lathes have variable speed drive (40 to 1400 RPM), and are instantly adjustable while work is turning—without shifting belts! You can also depend on the flexibility of Logan lathes. They have a 9" swing over saddle, 14⅝" swing over bed, and a 1 1/16" collet capacity to permit a wide variety of operations. But, specifications tell the full story. So, write today for complete information.

Model 6510
$1,775.00
F.O.B. factory

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WHAT'S AHEAD... in Metalworking

TRENDS

Production outlook continues to improve . . .

Continued improvement is the forecast for metalworking across the country. Though current operations are somewhat spotty, the general outlook is optimistic.

Steel production is definitely on the upswing. Automotive ordering is increasing, construction orders have started to come in, and the feeling is that the steady pickup now being registered will continue throughout the year.

Delivery times are still short and there are open places in the order books, but one producer feels that June may be the first time in a year that steel consumption has exceeded production.

Manufacturers of electrical equipment agree that business is improving and will continue good. The larger companies in the field, however, are not too talkative at the moment. Capital spending in this field is on the rise—a good sign.

Commercial heat treaters report improved activities so far in the second quarter. They are optimistic that second quarter results will show a 10 to 15% improvement over the first quarter. This gradual improvement is expected to continue throughout the year.

Industrial fastener manufacturers have experienced a slight upturn in orders. Better sales forecasts for their major customers are working their way back to the component supplier, they feel, and they predict better activity this quarter than last. The latest monthly index shows fasteners shipments up 2 points to 76 (1956-58=100).

Tool and die manufacturers report spotty conditions, but hope for improvement. There is no word on new programs in Detroit, and it seems no one is placing orders for delivery beyond June. Backlog in the industry showed a 8% increase in the latest reports, but this is still 38% below this time last year, when automotive orders were coming in strong.

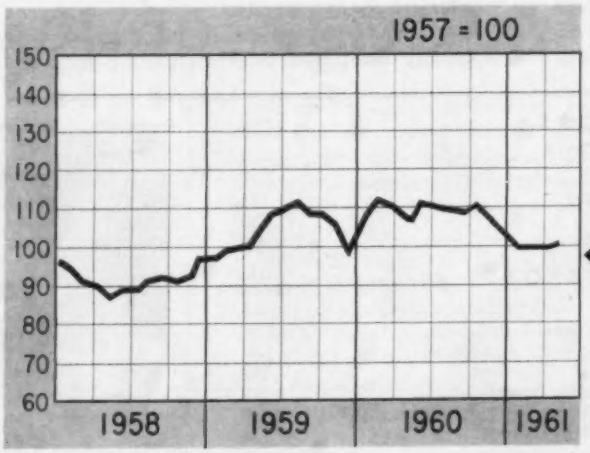
Business in plating shops continues to improve, with each month showing a little better than last, and they expect this trend to continue. Several companies report the main source of strength is coming from radio-TV manufacturers or makers of components for these items.

Sheetmetal shops show evidence of recovery. Those tied to the construction industry are already quite cheerful. Shops tied to hard-goods industries are a bit more cautious in their optimism, but the prevailing feeling is that the worse may be over.

Railroad car manufacturers have reported a flurry of inquiries in the last few weeks, but they add that predicting is very difficult.

Metalworking job shops expect orders to climb, but no one expects a business boom. Said one, "We expect business to pick up, but the way things have been going for the past few months, we'll have to hustle just to come out even this year."

Radio and TV manufacturers, after months in the doldrums, report that sales are beginning to pick up. For the year, TV sales are expected to be about the same as in 1960, while radio should be up about 10%.



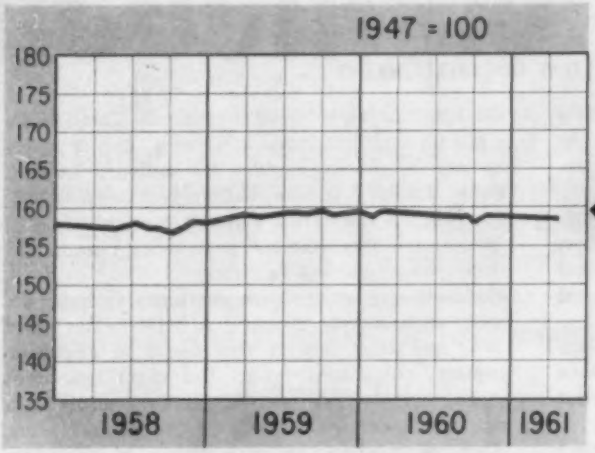
AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	APR Estimated	MAR Preliminary	FEB Revised	APR Year Ago
Total Index	**97**	**96**	**96**	**106**
Machinery	**96**	**95**	**104**	
Electrical Machinery	**109**	**109**	**115**	
Autos	**86**	**86**	**118**	
Other Transportation	**88**	**87**	**87**	
Other Metalworking	**99**	**99**	**110**	

TRENDS

WHAT'S AHEAD... in Business



AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	APR Estimated	MAR Preliminary	FEB Revised	APR Year Ago
Total Index	**159.4**	**159.5**	**159.5**	**159.8**
Metalworking Machinery	**194.4**	**195.1**		**190.4**
Other Machinery exc. Electrical	**173.8**	**173.8**		**172.6**
Electrical Machinery	**158.7**	**158.5**		**162.2**
Fabricated Metal Products	**147.1**	**147.1**		**148.0**

Brightening economic prospects . . .

The gross national product (the overall measure of U S business activity) dipped to $499.5 billion, on an annual rate basis, in the first quarter of 1961. As predicted, the U S economy began the year on the downgrade. However, a closer look at factors behind the drop in business activity reveals brightening prospects for the economy for the remainder of the year.

One reason for the decline in economic activity was the downturn in spending for producers' durable equipment that began after mid-1960. By the first quarter of 1961, outlays for producers' durables were down by more than $3 billion (on an annual rate basis) from last year's peak.

But a rebound in spending in this crucial sector of the economy is in the making. The McGraw-Hill New Orders Index shows a substantial rise in the volume of new orders for nonelectrical machinery in recent weeks. And the high level of capital spending planned for 1961 indicates that additional gains in order volume are likely.

Similarly, inventory reductions, which also figured crucially in the business downturn of recent months, also are coming to an end. Shrinking manufacturing sales and orders volumes, which set off inventory trimming months ago, are giving way to expanding sales and orders volumes. As the business volume measured by these key figures grows, the need for higher inventories and greater manufacturing output will swell overall economic activity.

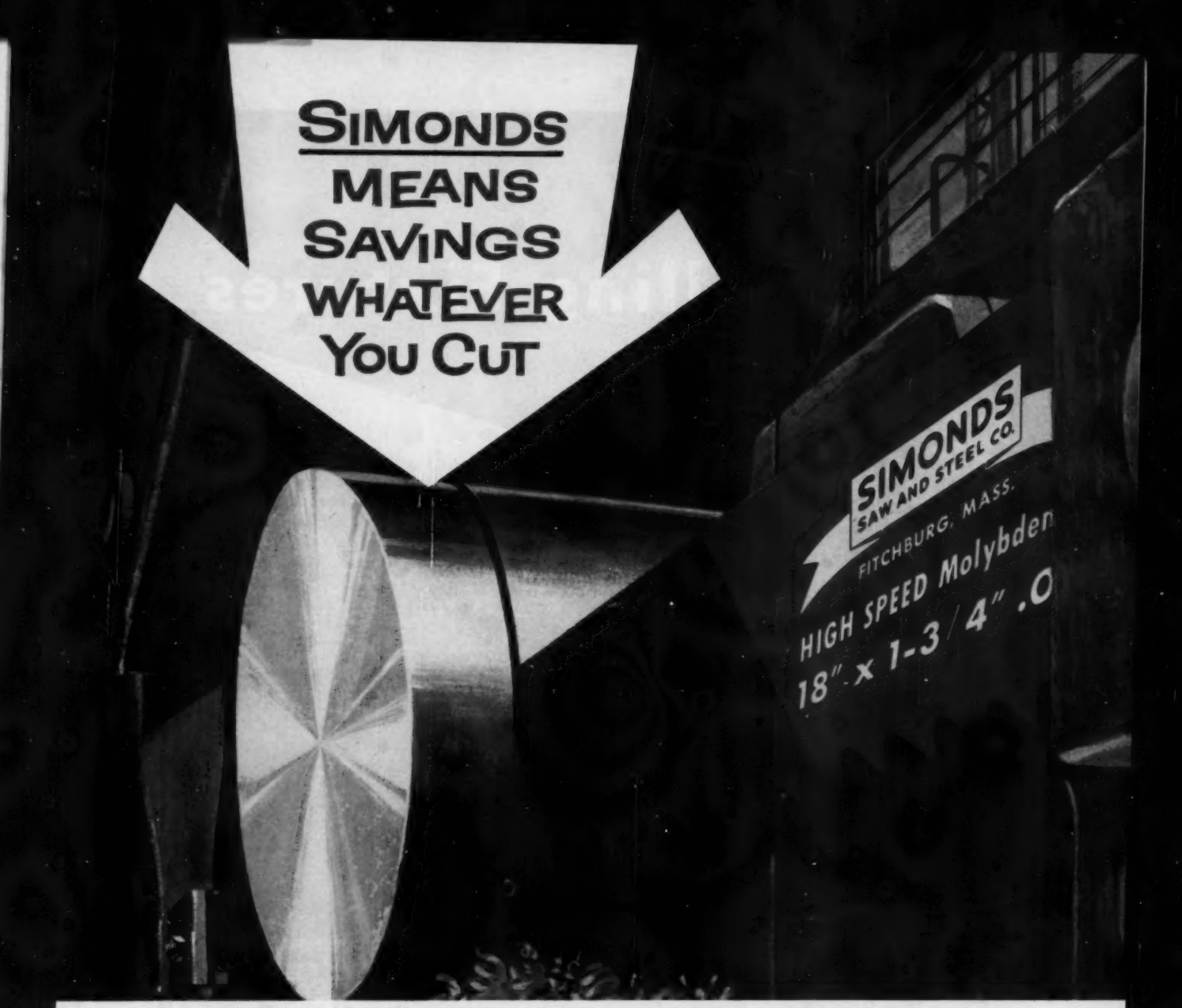
Recent evidence suggests that spending for consumer goods and services and for housing also are on the rebound. Moreover, costs of borrowing to finance the purchase of a new home have declined in recent weeks and are likely to fall even further. And this reduced cost of home mortgage credit will support the upswing in housing construction activity observed in recent weeks. And the upturn in retail sales now underway completes this brightening picture.

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	146.5	145.9	152.7
Steel ingot operations (thousands of tons)	1,858	1,784	2,210
Electrical power output (million Kilowatt hours)	14,254	14,311	13,656
Production of automobiles and trucks	147,930	158,288	172,971
Engineering construction awards (Eng. News-Record—millions)	418.8	555.0	530.4

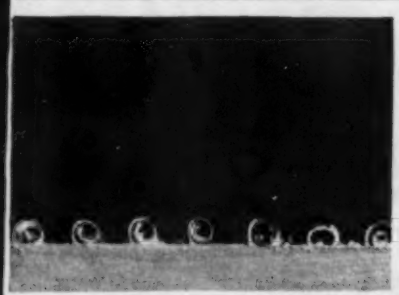
QUARTERLY BUSINESS INDICATORS	Latest Quarter	Preceding Quarter	Year Ago
Gross National Product (billions)	499.5	503.5	501.3
Expenditures of new plant and equipment (billions)*	35.50	35.90	33.60
Profits after taxes in primary iron and steel industry (millions)	150	132	204
Profits after taxes, machinery (except electrical) (millions)	193	231	272
Profits after taxes in electrical machinery industry (millions)	239	250	362
Profits after taxes in motor vehicles and parts industry (millions)	416	191	318
Motors and generators new orders index (1947-1949=100)	134	158	169

*Seasonally adjusted

SIMONDS MEANS SAVINGS WHATEVER YOU CUT



"Ups" your cut-off capacity . . .
SIMONDS "RED END" Hacksaw Blades



Simonds tough, edge-holding "Red End" Blades don't hack at metal, but cut curled chips like the cutting tool on a lathe. Made to rigid, high quality standards, they have greater resistance to breakage . . . step up your cut-off capacity.

Longer wearing, too, Simonds own unique cross-rolled steel and special heat treatment add many valuable hours of cutting life to every blade . . . provide important savings all along the line.

Simonds "Red End" Power Blades come in All-Hard and Shatter-proof types in all standard lengths, thicknesses and tooth spacings. Three types of Hand Blades are available in all standard specifications . . . insure a "right" blade for every need.

Get off-the-shelf delivery from your local Simonds Distributor . . . start saving today.

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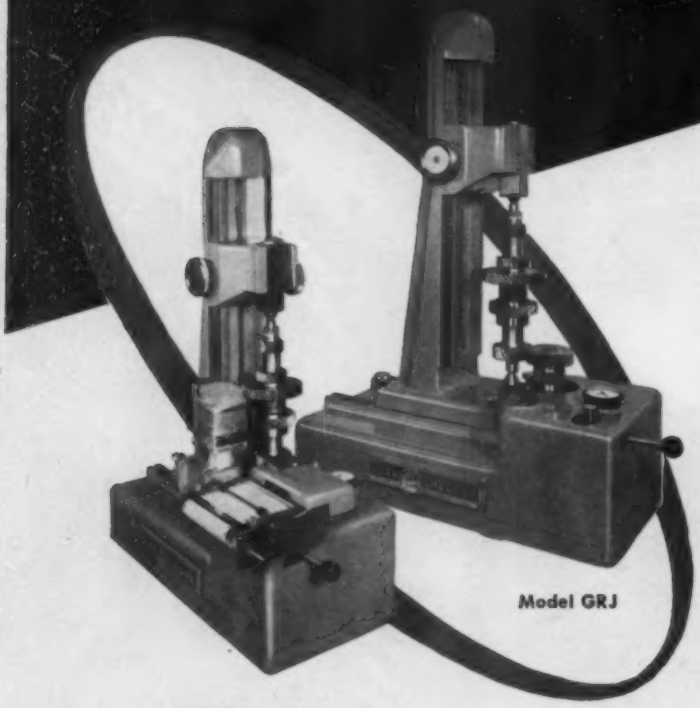
CIRCLE 348 READER SERVICE CARD

NEW RED RING Gear Rolling Fixtures



Model GRJ

Model GRJ with motor drive and recorder

Model GRH with motor drive

These Red Ring Rolling Fixtures furnish a quick composite check of gear errors such as runout, tooth spacing, tooth profile, helix angle and tooth surface roughness. Model GRH is used for flat gears, Model GRJ for either flat gears or those having integral shafts.

Either model may be equipped with a constant-speed motor drive to eliminate the factor of non-uniform manual operation.

The motorized fixtures may also be equipped with a tape recorder for permanent inspection records.

For further information ask for Bulletin C 60-8

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Best Kind of Tax Incentive

Best kind of tax incentive

Nothing is more important to the future of the nation's economy than to have an industrial plant second to none in the world.

Such a plant, making full use of today's technological advancements, is imperative if our economy is to grow, our productivity to increase, and our competitive position abroad to be strengthened.

It is our great misfortune . . .

that we do not have such a plant. Our production machinery is obsolete. It is less efficient than Europe's or Russia's.

Washington, conscious of our disadvantageous position, wants to correct the situation. President Kennedy is dedicated to this purpose.

In a commendable effort to make a quick start, the administration is sponsoring prompt enactment by Congress of a tax credit plan.

The tax credit idea breaks with American tax precedent. It does not enable a manufacturer to recover his investment in new plant and equipment any faster than he can at present. What it does is to offer him an extra inducement for such investment by allowing him a tax credit that he can subtract from his total tax bill.

The tax credit plan . . .

already is being subjected to a barrage of criticism of the following nature: It is said to be a gimmick and not true tax reform. It is a subsidy; and industry is not seeking and does not want a subsidy. It sets up inequities in that a manufacturer who has spent a lot of money for modern equipment will be penalized at the expense of the manufacturer who has spent only a little. Its provisions are not attractive enough to stimulate sufficient new investment to do much good.

Despite these objections, the tax credit plan has certain undeniable virtues. It is simple in concept. It is easy to understand. It has the kind of lure that any tax forgiveness possesses. It is not the monstrosity that some of its opponents try to make it out to be.

But in the bitter wrangle over its merits it would be tragic to lose sight of our prime objective — to put on the books a law that will stimulate enough investment in capital goods to get the national economy rolling again.

Washington reports are that the tax credit plan has a poor chance of passage. Main opposition seems to center on its divorcement from depreciation rates and its "tax handout" aspect.

Why not, under the circumstances, pass a bill just as effective (and perhaps even more so) but without these objectionable features?

The Small Business Tax Revision Act of 1958 permits a manufacturer to write off in the first year 20% of up to $10,000 of capital expenditures (or $20,000 on a joint tax return). This provision is available to both large and small firms.

All that needs to be done . . .

is to remove the top limits of $10,000 and $20,000 and allow the 20% writeoff regardless of the size of the investment in capital equipment. The present depreciation rate structure thus would be retained, with the initial 20% allowance added without restriction.

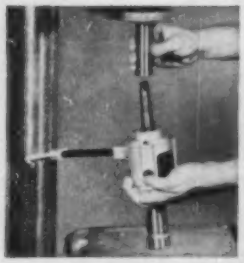
This kind of incentive would have an even greater lure than a tax credit. It would let manufacturers recover their capital investment more quickly than they can now.

The cost to the Treasury, to be sure, would be larger the first year than tax credits would be. But the contribution to winning the battle against plant and equipment obsolescence also would be larger. And within a short time the Treasury itself would feel the beneficial effects in higher tax revenues stemming from a more efficient, lower-cost, more profitable industry.

Burnham Finney EDITOR

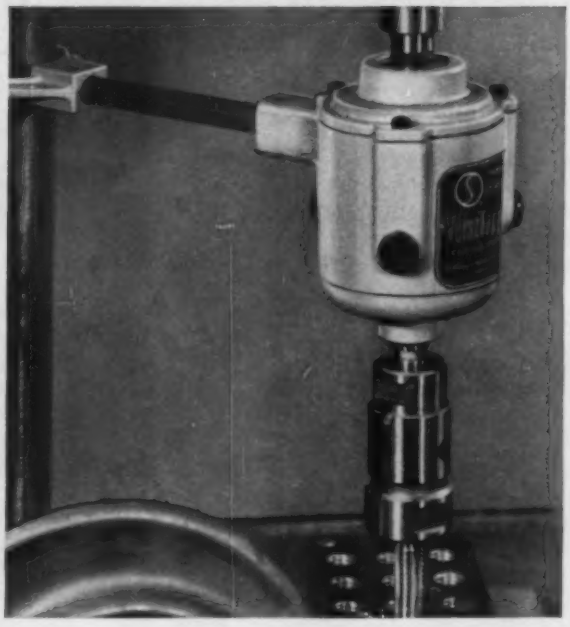
iT'S A FACT!

You can tap 1/2" holes with a light drill press and Supreme's New VersaTAPPER



Shaft of Model 6100 is held in drill press chuck. No. 6200 (above) has Tapered spindle.

Supreme Accutap Chuck is standard equipment with VersaTAPPER. Capacity 0-½"



VersaTAPPER is a compact precision-made tapping unit. Fits any drill press . . . features half-inch capacity range plus 4-time increase in torque. Easy to install. Simple and quick to remove after use.

VersaTAPPER...
operates easily in any material
. . . with widest capacity range
. . . yet costs far less

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The *new* VersaTAPPER has scored an instant success with production people everywhere. It has more versatility than other tapping devices. It has the *widest capacity range*—from 0 to ½", but depending on application, use of taps smaller than No. 10 is limited. It develops *more power*—makes the tapping of ½"-13 holes a simpler matter, even with light duty drill presses. VersaTAPPER is *simple to use*—can be successfully operated by anyone in your shop.

All of these features at the remarkably low price of $63.00 complete marks VersaTAPPER as a product you must see at the first opportunity. It's available at your local Supreme Chuck distributor. Call him soon.

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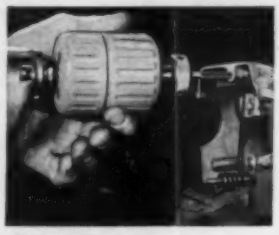

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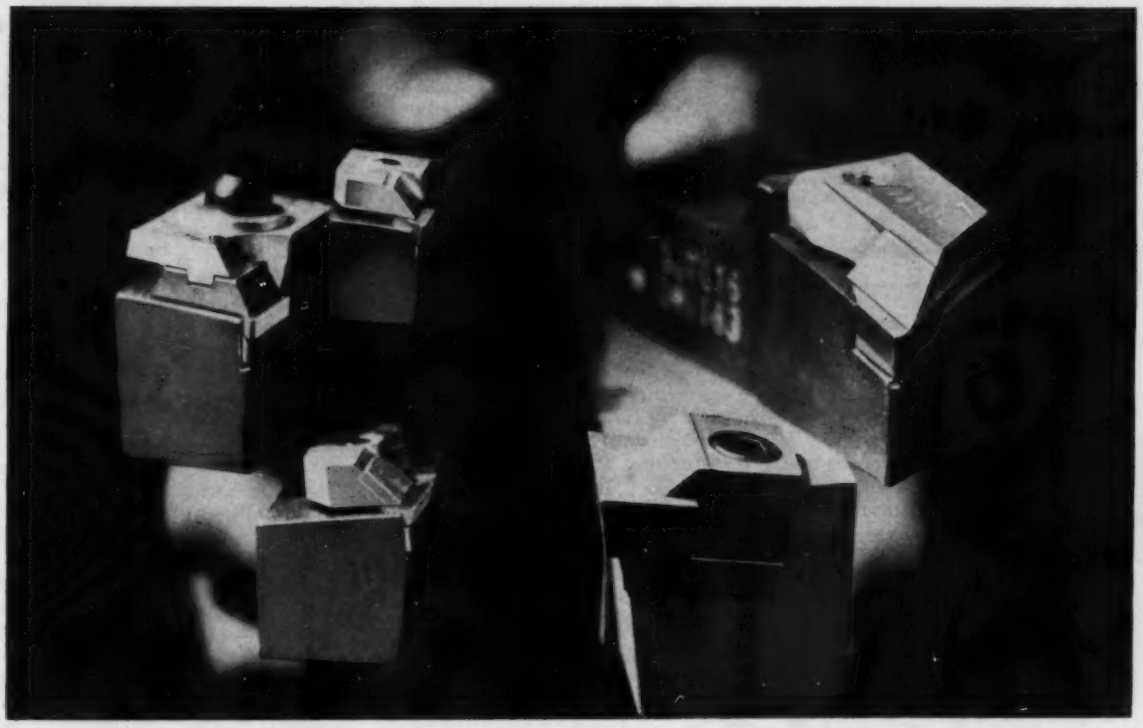


The case for disposable inserts . . .

Cut tool life and boost savings?

Jump machine speeds and forget about tool life. By following this dictum, and by switching from brazed single-point tools to cemented-carbide inserts, one company has made spectacular savings in tool and machining costs

By Richard D Zimmerman,
carbide application engineer,
Metallurgical Products Dept,
General Electric Co

Holding back on machine speeds, so that tool life is longer, is like using an engineer to sweep the plant floors. The potential of neither the machine nor the man is realized.

In the past, both tool engineer and standard textbooks have stressed the importance of tool life. Their argument: High tool cost, plus time for changing and resetting, more than offsets any time saved by speeding the machine.

Today this attitude is tool-wise but machine-foolish in many operations. In recent years, the introduction of disposable inserts has changed industry thinking considerably. Changing from single-point carbide tools to cemented-carbide inserts gives spectacular savings in some applications. [For previous articles on this subject, see *AM/MM* —Apr 6 '59, p117 and Feb 20 '61, p91—Ed.]

Economies with inserts are not confined to machining costs, but extend to tool expense and sometimes even to machine investment. One large Eastern manufacturer has saved $179,400 a year in tooling costs alone. Moreover, his changeover program, which involves dropping almost all brazed single-point tooling, still is only 85% completed.

Thanks to the inserts, it is now often profitable to speed machine-tool rpm to maximum. This high-efficiency machining, which may re-

TABLE I: COMPARATIVE COSTS PER CUTTING EDGE

SINGLE-POINT BRAZED TOOL:

Initial tool cost, including chipbreaker	$ 5.50
Cost for 7 regrinds at $1.00 per regrind	7.00
Total cost of 8 cutting edges	$12.50
Cost per single cutting edge	$ 1.56

DISPOSABLE INSERTS:

½-in. triangular positive-rake precision-ground	$0.50
½-in. triangular positive-rake precision-ground	0.30
½-in. square positive-rake precision-ground	0.55
½-in. square negative-rake precision-ground	0.14
½-in. square negative-rake utility-ground	0.09
½-in. triangular negative-rake precision-ground	0.31
½-in. triangular negative-rake utility-ground	0.15

(Material for both types of tools: Carboloy grade 370 cemented carbide)

duce machining costs as much as 50%, also cuts operating overhead. These savings more than overbalance extra costs of shorter tool life.

In the plant referred to above (which provided the data given in this article) management states that, to carry the present work load with single-point brazed tools, the company would have to invest several hundred thousand dollars in new buildings and machinery.

Advantages of inserts

Let us check some advantages of disposable inserts over brazed single-point tooling:

• **Tool quality is better.** By retaining disposable inserts with mechanical holders, we completely rule out brazing strains as well as poor brazing itself. And because the inserts use mechanical chipbreakers, which give sure, positive chip control, there is no tool failure because of overbreaking of chips. We might mention here that when a disposable insert operates under exactly the same conditions as a properly ground single-point tool, there is no perceptible difference in tool life.

• **Tool changing is faster.** Disposable inserts can, of course, be indexed, so that each cutting edge will repeat to close tolerance. This indexing applies not only to each single insert, but also to the entire batch of inserts of any given type. Tool-changing time thus is cut anywhere from 15 to 60 seconds.

On multiple-head or multiple-spindle tools, the operator usually can change inserts while another tool is cutting. Here the tool-change time is free. This change time applies, of course, to both positive-and negative-rake toolholders and inserts, available in all styles of tools.

• **Tool costs are reduced.** The manufacturer under discussion is machining materials that are about the toughest normally used in industry: Stellite, Hastelloy B, titanium, Chromalloy, Inconel, Incoloy, 321 stainless, 4340 heat-treated steel, and other high-strength materials. Naturally tool life (whether brazed tools or inserts) is rather short.

Reduced tool costs

Here are some figures that reveal the actual savings inserts can bring. Table I compares the average cost ($1.56) of a single cutting edge for a standard single-point brazed tool with typical costs for disposable inserts. Material for both types is Carboloy grade 370 cemented carbide.

The cost per cutting edge of disposable inserts varies from 9¢ to 50¢, with positive-rake inserts normally costing more than those of negative rake. Average cost for inserts is 41¢ a cutting edge.

In our example, then, use of disposable inserts brings an average saving per cutting edge of $1.15 ($1.56 – $0.41). The plant under discussion uses 600 single cutting edges a day; thus the potential yearly savings are $179,400 (600 x 5 x 52 x $1.15).

In the above calculations, cost of toolholders does not appear, for two very good reasons: (1) Toolholders are for all practical purposes indestructible on the normal job; they can be maintained in perfect condition merely by replacing the seats or the chipbreakers. (2) The cost of these toolholders would not exceed the cost of broken or smashed single-point brazed tools, which also was not included in the cost breakdown for the single-point tool.

Savings in machining

The savings described above relate only to tool costs. Inserts can also reduce machining costs by reducing labor and overhead expenses. Here are two examples of the immediate cash-in-pocket savings:

Example 1 (See Table II): The machining operation was on a cone of 321 stainless steel. With the old single-point brazed tool, the job was timed at 2.94 hours, which included three changes of the single-point tool. Cutting speed was about 225 sfm, with 0.005- to 0.010-in. feed. The machines were 42-in. Bullard Cut-masters.

With Carboloy grade 370 inserts, cutting speed was boosted to 875 sfm (a jump of almost 300%). Naturally, the tool wore out faster, and six separate tool changes were necessary. But the total time for the new method—1.7 hours—was only about half that for the old.

We can break these figures down further. Let us assume that labor cost is $2.10 an hour, with 200% overhead. If cutting-tool cost is $1.56 for single-point brazed tools and $0.60 for each cutting edge of an insert, the cost comparison will look like what appears in Table II.

The total yearly savings of more than $100,000 in this operation were definitely proved by the company. There was an added bonus: Because of the speedup in machining, two of the Bullard machines could be released to the shop for other work.

Example 2 (See Table III): In the second machining operation, work was on a 22-in.-dia ring of 321 stainless. Formerly, this ring was machined by single-point brazed tools in a lathe. Time required was 1.66 hours (including time for one tool change) at speeds of 200 to 250 sfm.

After some study, the ring was transferred to a 30-in. Bullard Man-au-trol; machining was with disdisposable inserts, at 850 to 1250 sfm. With the more efficient inserts, operation time was cut to less than half (0.58 hours, including two changes of insert).

If we use the same cost-per-cutting-edge figures, together with the same labor and overhead charges, as in the previous example, we get the results shown in Table III. And here the $79,794 savings does not reflect the fact that one Bullard Man-au-trol replaced three lathes, which then became available for other work.

From these two case histories, it is apparent that tool changes are doubled when disposable inserts replace single-point brazed tools. In other words, the company deliberately sacrificed 50% of cutting-tool life in order to machine at high speeds. But even with this sacrifice, there is a cost reduction over brazed tools. And the company feels that its potential savings in tool costs ($179,400) will be far surpassed in the future.

Table IV shows the average cutting speeds and feeds for the company's disposable-insert program. In this table the feeds vary widely, because when the depth of cut is great, the feed has to be reduced—but not the speed.

Caution pays off

We have seen that inserts can bring substantial economies in machining operations. They can also bring a few problems, which should receive careful attention.

One of the main factors that affects "Hi-E" machining is vibration. To lick this bogey, three requirements are absolutely essential:

(1) Machines should be rugged, with enough horsepower to do the job. (2) Clamping or workholding setups should be able to absorb any stray vibration (in some cases the workholding fixtures can only be described as massive). (3) To eliminate tool overhang, toolholders should be of heavy-duty type, with short, sturdy shanks. If possible, cutting tools of the lead-angle type are recommended.

There should be no inference here that disposable-insert tooling is a cure-all (or even the second-last word) in machining techniques. The only inference is that, for many plants now burdened with single-point brazed tools, disposable inserts can reduce tool costs.

In passing, we should mention that large companies are not the only segment of Metalworking that can benefit from insert tooling. Even the smallest shops can often save considerable time and money.

A small shop that machines with single-point brazed tools must either invest in its own diamond wheels and grinding equipment or make arrangements to send out the tools for resharpening or rebrazing.

If, on the other hand, the small shop invests directly in cemented-carbide inserts and the proper toolholders, it can at one stroke get faster and cheaper machining—without any investment in grinders and grinding wheels. •

COST COMPARISON FOR MACHINING OPERATIONS

Old Method: Single-point brazed tooling

New Method: Disposable cemented-carbide inserts

TABLE II: Machining a cone (321 stainless)

Machine hours per unit (old method)		2.94 hours
Machine hours per unit (new method)		1.70 hours
Machine hours saved per unit		1.24 hours
Tool cost per unit (old method) 3 x $1.56 —	$	4.68
Tool cost per unit (new method) 6 x .60 =		3.60
Total cost saved per unit	$	1.08
Actual machine cost labor and overhead per unit (old method)	$	18.51
Actual machine cost labor and overhead per unit (new method)	$	10.71
Actual savings in machine costs per unit	$	7.80
Yearly savings in tool costs (225 units per week)		$12,636.00
Yearly savings in machining cost (225 units per week)		$91,260.00

TABLE III: Machining a ring (321 stainless)

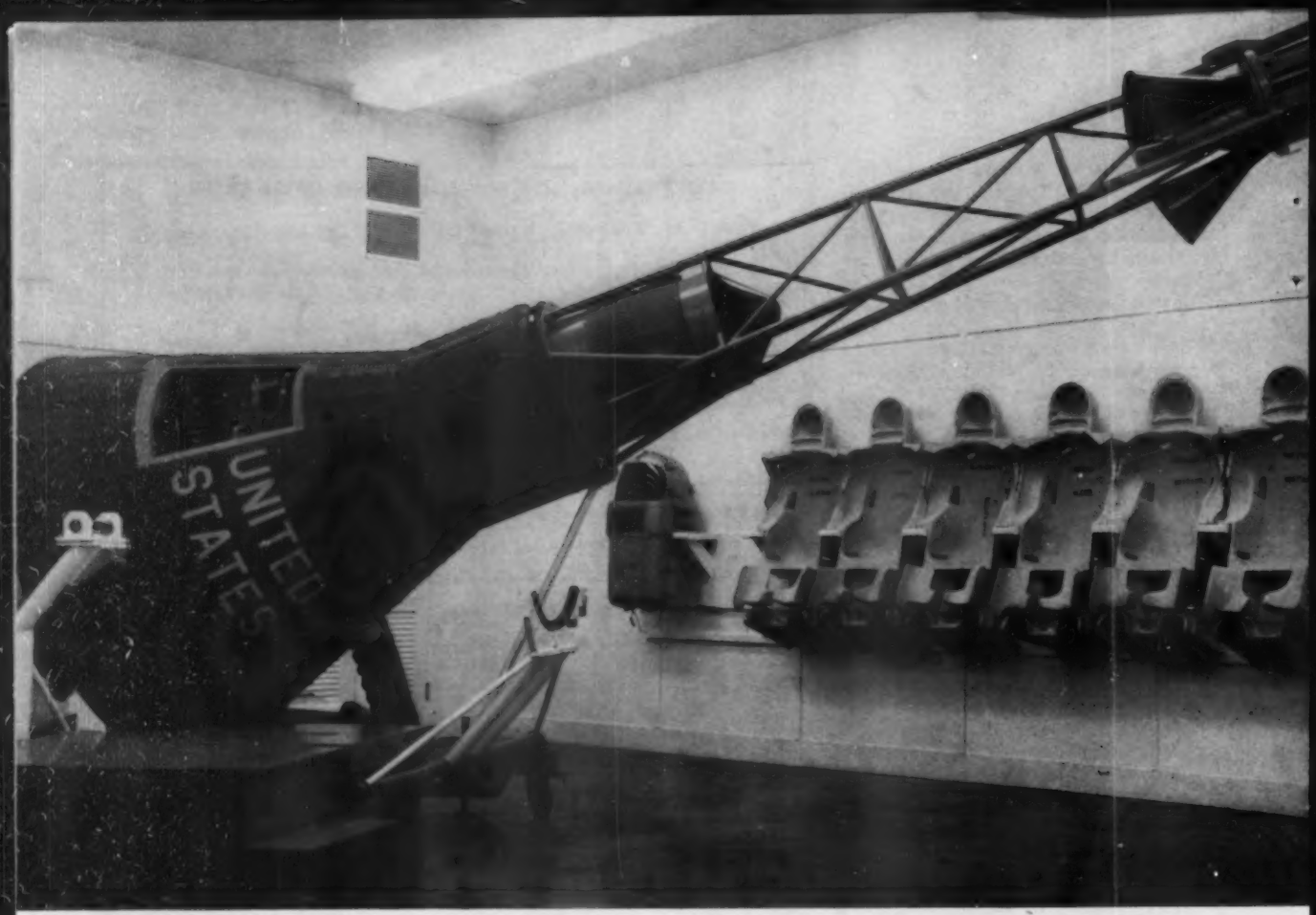
Machine hours per unit (old method)		1.66 hours
Machine hours per unit (new method)		.58 hours
Machine hours saved per unit		1.04 hours
Tool cost per unit (old method)		$ 1.56
Tool cost per unit (new method)		1.20
Savings per unit in tool cost		$ .36
Actual machine cost labor and overhead per unit (old method)		$10.47
Actual machine cost labor and overhead per unit (new method)		3.65
Actual savings per unit in machine costs		$ 6.82
Yearly savings in tool costs (225 units per week)		$ 4,212.00
Yearly savings in machining costs (225 units per week)		$79,794.00

Cost comparison for two machining operations reveals savings in tool cost, labor and overhead, and machine hours when disposable inserts do the machining. See text for background material on these operations

TABLE IV: Machining with insert tooling: Average speeds and feeds

MATERIAL	ROUGHING SPEED (sfm) .18" — .03" FEED	FINISHING SPEED (sfm) .010" — .005" FEED
321 Stainless steel	500 — 875	875 — 1250
410 Stainless steel	400 — 600	600 — 1000
4340 tool steel	400 — 500	500 — 800
A286	200 — 300	300 — 600
Inconel	150 — 250	300 — 500
Incoloy	200 — 300	300 — 450
Timken Alloy	200 — 250	250 — 400
Stellite	150 — 250	200 — 300

These average feeds and speeds are used by one company when machining with disposable inserts. Changeover from single-point brazed tooling to inserts has saved the company $179,400 a year in tooling costs alone



Astronauts were checked out on instruments in this space capsule at McDonnell Aircraft Co. Outer shell is made of René 41 "shingles." Inside is fiberglass insulation and then the double-wall inner shell made of 0.010-in. titanium

How they made the space capsule

By the time you read this, the U S will have sent a man up to 600,000 ft. The capsule for this flight has an inner shell that called for special techniques to form and weld large panels of 0.010-in. titanium

By William Dubusker, mfg. manager
Project Mercury program
McDonnell Aircraft Corp, St Louis
as told to Ted Schafers
AM/MM St Louis correspondent

There is nothing easy about getting a man into space, and manufacturing the space capsule above is certainly no exception. This is especially true of the double-wall inner shell (hidden in this picture inside the outer shell of René 41).

The inner shell is made of thin titanium panels which are intricately formed and then welded into cones and spherical shapes—to close tolerances.

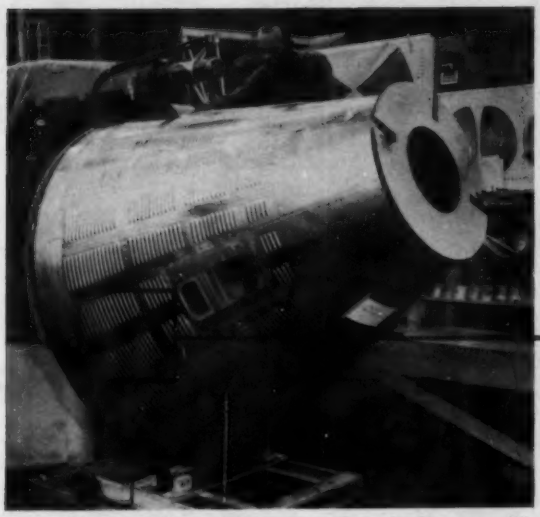
McDonnell Aircraft, which has a $110-million contract to make 20 of the units for Project Mercury, the U S man-in-space program, did the job by hot-forming the panels, and by developing special fixtures and techniques for a variety of resistance- and arc-welding operations.

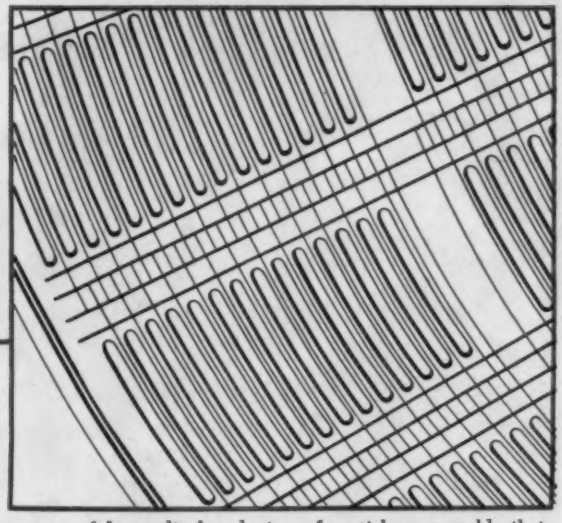
The inner shell of the capsule is basically a pressure vessel consisting of a cone-shaped side wall with a large spherical pressure bulkhead on one end and a small pressure bulkhead on the other. The side wall and the large bulkhead are both made of two thicknesses of 0.010-in. commercially pure titanium. The inner thickness is smooth, and the outer one is stamped with a pattern of strengthening beads.

Because of size limitations on the available titanium sheet, each layer of the large bulkhead is made from three pieces welded together, and each of the side-wall cones is made from eight. And the side-wall cones must fit one inside the other so that the mating surfaces are in intimate contact all over. This calls for precision trimming, fixturing, and welding.

Skins must be smooth

Further, there can be no wrinkles that might interfere with resistance seam welding, so the forming operation is critical. On top of this, titanium has to be heated for crack-free forming operations (*AM*—July 28 '59, p108).





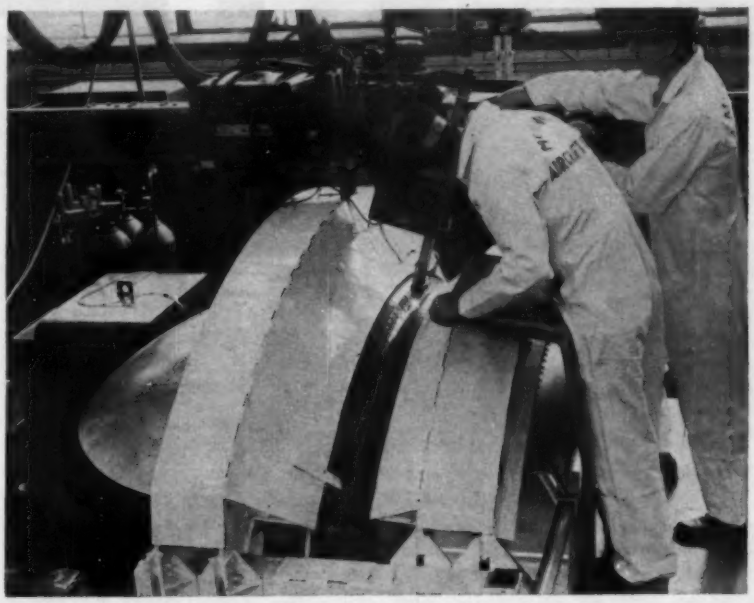
Spotwelding attaches stiffeners to side-wall skin assembly. Detail shows offset rows of reinforcing beads and intricate pattern of longtudinal and circumferential seam welds that hold the two 0.010-in. titanium skins together

McDonnell found that the forming must be done right at 1000 F, and the job has to be done quickly. The panel—in position between the dies of a drop hammer—is brought to temperature by resistance heating while an operator checks the temperature with a hand pyrometer.

Hot and fast

At 1000 F he shuts off the power; another man snatches the fiberglass insulating sheets from between the dies; and a third man trips the control lever. The drop hammer strikes the piece a heavy blow, and the job is done: 2 min for the entire heating and forming operation.

The dies for this operation are of conventional design with lock-stretch beads around the part trim line. McDonnell made each lower die of Kirksite and then cast lead directly against the Kirksite to make the upper die. Some of the panels had different bead patterns because of cutouts in the skin, but for the forming operation, this meant only that certain beads were omitted.



Rotating fixture moves the work past stationary Tig torch at 7 ipm to join two sections of spherical bulkhead. Segmented fingers hold edges of joint in alignment

Dies make different panels

The panels with full sets of beads were run first. Then the dies were re-worked to suit the pattern of the other panels. This was simply a matter of grinding off the appropriate beads on the punch and filling in the mating depressions with Hydrocal plaster.

The tooling for this high-temperature operation was made of low-melting-point alloys because the resistance heating system employed affects the work only. A set of air-actuated copper clamps at each end of the die is connected to a Hufford 100-kva resistance heater.

The titanium sheet to be formed is clamped in these jaws and thus completes the electrical circuit. To allow for thermal expansion in the sheet, the clamps can be adjusted, both lengthwise and crosswise.

In operation, the copper jaws clamp the titanium sheet about an inch above the lower die. Fiberglass cloth placed over and under the sheet acts as thermal and electrical insulation during the heat-up period. Then the three operators give it the old one-two.

After forming, the panel is rough trimmed and then strain-relieved for 30 min at 1000 F to prevent crack-

Fixture holds first two panels of outer conical skin for Tig welding. Straps keep part tight against contour of fixture

Inner and outer skins are seam welded together. Carriage-mounted fixture holds work for intermittent seams

ing from the severe forming in the bead areas. During this heating and cooling cycle, the part is clamped in a fixture that matches the conic shape of the part. The next operation is pickling and then dye-penetrant inspection.

The three spherical parts that make up the outer layer of the larger pressure bulkhead go through similar operations, allowing for the difference in shape.

Trimming must be right

Then comes the important trimming operation, which determines, to a large degree, the final size of the various components. A special machine trims the parts to size with a 2½-in. HSS saw blade. Speed is 210 rpm, and feed is 8 ipm. This combination produces a smooth edge that doesn't need any draw filing or hand fitting for welding.

Welding starts by joining the eight segments of the smooth inner conical skins by Tig welding (tungsten, inert-gas) without filler metal. To make a good joint with this technique, McDonnell found that the 0.010-in. titanium sheets have to be spaced with a maximum gap of 0.004 in. The length of each weld on the inner skin is about 4 ft; on the outer skin about 6 ft.

The fixturing for this operation includes a conical support for the parts and a row of segmented clamps on each side of the joint. The clamps hold the parts in precise alignment and also serve as a chill bar.

Panels are strapped down

To hold the proper shape, the panels are strapped down against the conical supporting fixture during each weld. Then, as additional panels are added to the assembly, each one in turn occupies the same relative area on the contour of the tool.

The spherical skin assemblies are welded in much the same manner, but their shape causes an added complication. They're made in three sections—a center piece and two side pieces—so the joint forms a curved path about 6 ft long.

The fixture for this operation rotates the whole part so that the joint to be welded moves past a stationary torch, just the opposite of the setup for welding the cones. In both operations, however, the welding speed is 7 ipm.

When the skin assemblies for the conical and spherical sections have been completed by arc welding, the inner and outer skins of each section are joined together by an intricate pattern of resistance seam welds (see p131).

Here's where the size of the two cones is extremely important. Because of the seam-welding operation, they must fit together in intimate contact.

In the cone section, the total length of these circumferential and longitudinal seam welds is about 22,000 in. The result is hundreds of small, separately sealed pockets, which means that a crack anywhere will stop instantly.

Special handling fixtures at the welding machines move the work radially or longitudinally, depending on the machine, with the electrode providing the driving force.

Wide variety of welds

In subsequent operations, stiffening rings and angles are attached by either seam welding or spot welding. Spot-welding fixtures are moved by hand, but the path of travel is established by the fixture.

Many combinations of material thickness are encountered in resistance-welding stiffeners to doublers, and to skin, etc. Spot welds have been made through as many as seven layers, and more than 300 different thickness combinations have been welded successfully. •

Forging 900 track links an hour

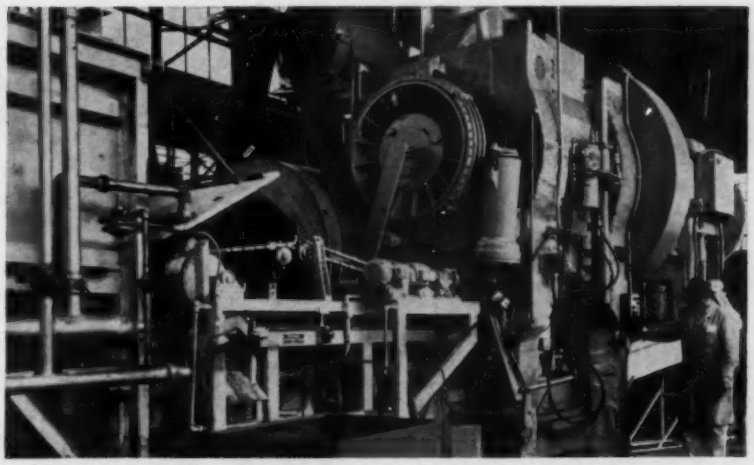
Automatic handling through furnace and press permits forging of track links at a rate of 900 per hour. The four-stage die includes two blocking operations, finishing, and trimming and coining.

AmForge Div, American Brake Shoe Co, is producing 40,000 medium-sized track shoes per month for Caterpillar Tractor in the new forging line at its Chicago plant. Other sizes will be produced and AmForge hopes to capture an increased share of the market for 10 million track links a year for new tractors—plus a share of the large replacement market.

The line is built around the 2500-ton automated forging press (*AM*—Oct 6 '58, p90) developed by Erie Foundry. The trim station has been added since the press was originally described, by including a pneumatic cylinder to give an added push to the trim die.

The special AmForge-designed gas-fired furnace permits a very short heating cycle to bring the billets up to 2200 F. Transfer equipment built by Wilson Automation transfers the hot billets quickly from the furnace to the press. A by-pass arrangement to a chute permits the furnace to continue operating on schedule if a jam occurs in either handling equipment or press.

Insert dies are cooled by air jets in the adapter block and by the use of an air hose by the operator. A complete set of four die inserts costs about $400, but the short heating cycle and rapid transfer reduce scale and result in longer die life than that for hammer forging. •



Mechanized forging line at AmForge converts billets into track links in a 4-stage die (including trimming). Two men do work that formerly took 15

Track link now being produced is shown with key figures in AmForge development: Arthur Tichener, pres, John Elbin, vice pres, and Stanley Vickers, director R&D

World trade in machine tools rising

Five countries represent nearly two thirds of the market for US machine tools. Canada is the principal market, taking 20% of US exports. The United Kingdom, France, Brazil, and Japan follow in that order.

West Germany is the leading supplier to the US, outranking all other countries in forming tools and having passed Switzerland in cutting tools. These two countries account for nearly 60% of imports. The United Kingdom accounts for another 20%. Sweden and Italy are the only other countries supplying significant amounts.

These figures come from a comprehensive study of world trade in machine tools just completed by the Metalworking Equipment Div, Business & Defense Services Admin. Prepared under the direction of Philip Bennett, director of MED, the study covers the years 1955-1958 and is availab'e from the Department of Commerce, Washington 25, DC.

During the 4-year period the US had the most favorable balance of trade in machine tools, with imports averaging 14.6% of exports. However, West Germany made the most dramatic gains and ranked ahead of the US in the last two years of the study.

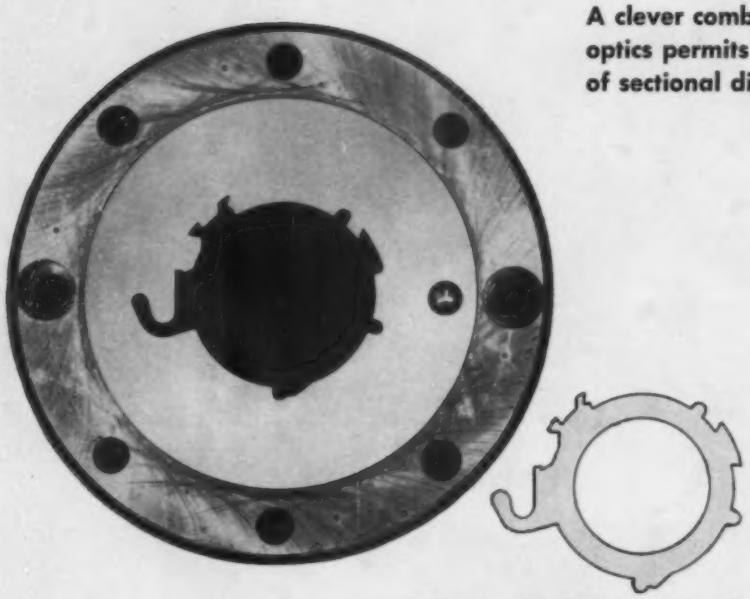
There has been significant increase in world trade in machine tools with a 40% increase (from $438 to $614 million) in the four years. World trade in all commodities increased on the average only 13% during these years.

Trade in forming type machine tools has increased at a much faster rate than for cutting type tools. Export by all countries of forming types increased 54%, while cutting types increased 35%. For further details see page 117. •

PRECISION PROFILE GRINDING

A clever combination of mechanics and optics permits precision profile grinding of sectional die blocks and cutting tools

By Oscar Loeffler, chief tool designer, Remco Industries, Inc, Newark, NJ



5-section die block (full size) is made of HCHC steel, Rh 62C, ¾ in. thick. Profile grinding time: 26 hours. Stamping shown is made with this die

3-section die block (full size) is made of HCHC steel, Rh 62C, ¾ in. thick. Profile grinding time: 13 hours

2-section die block (full size) is made of HCHC steel, Rh 62C, ¾ in. thick. Profile grinding time: 7½ hours

Precision profile grinding can be done in many ways. Unfortunately, however, almost every commonly used technique has the same serious drawback: the operator's attention is not on the workpiece.

He watches a drawing, a templet, a pantograph, or a tracer point—but not the workpiece.

Though you can grind a profile in many ways, there are only four basic operations. All techniques employ one or more of these steps:

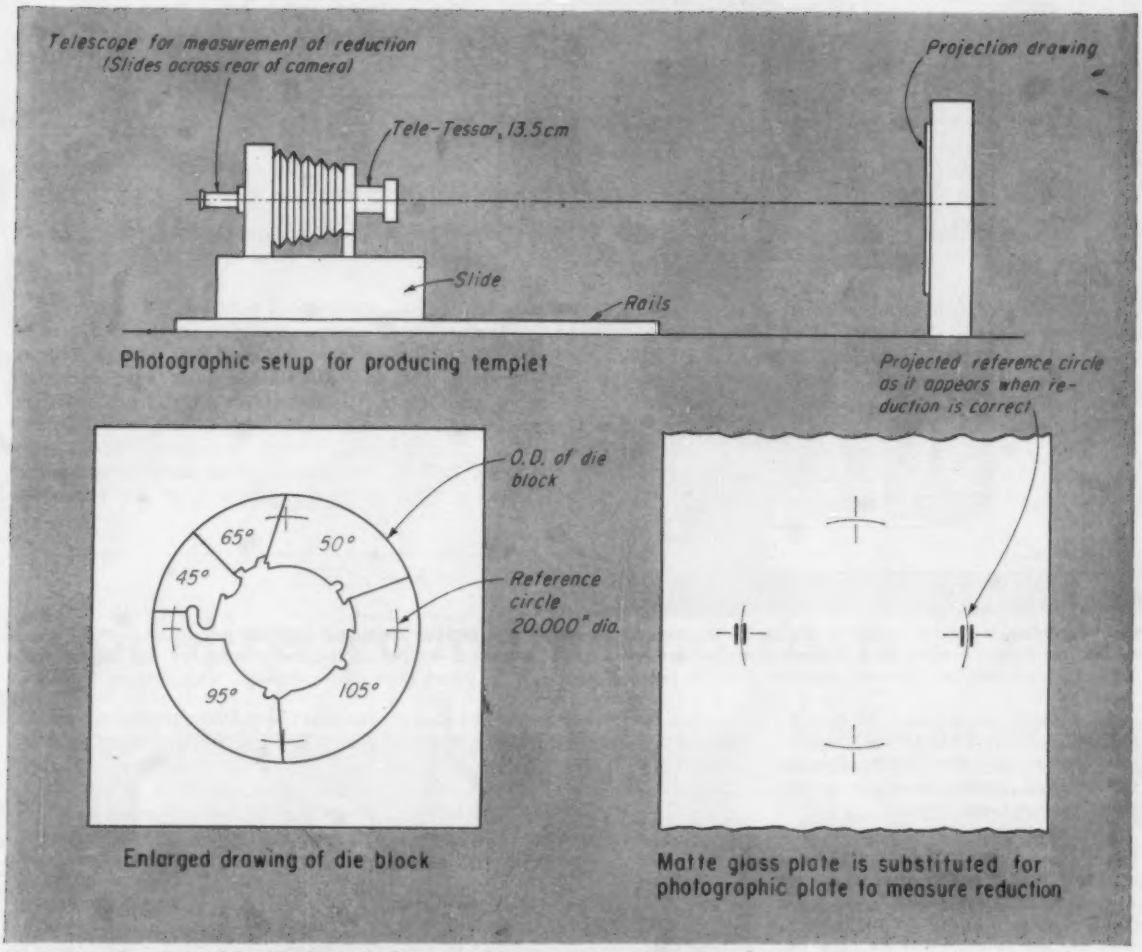
- The operator views on a comparator screen the enlarged profile of the workpiece and, superimposed upon this, an enlarged drawing of the finished part. On this screen, the operator also sees the image of the grinding wheel, and he moves the wheel along the desired path by manually adjusting the handwheels controlling X and Y axis motion.
- The operator traces out the profile in tiny increments on a highly enlarged (say 50:1) drawing with the tracer point of a pantograph. As he moves the tracer point (maybe 1/16 inch) on the drawing, the working end of the pantograph moves 1/50 of that amount over the workpiece.

The operator then views the workpiece through a microscope attached to the working end of the pantograph and brings the grinding wheel into position under the crosshairs of the microscope. In essence, he grinds a series of minute straight lines.

- The operator moves a V-shaped tracer over an enlarged-scale templet of the finished piece, and the motion is transmitted to the wheel through a pantograph. This entire operation can be done automatically.
- The operator forms his grinding wheel to the exact profile desired on the workpiece. (Because this technique lacks the flexibility of the others, it won't be discussed here.)

Look back over the first three methods and you'll see that in each case the operator's attention is elsewhere than on the workpiece. The first and second methods have an additional disadvantage: the light

# of split die blocks



Projection drawing of die block, and photographic setup for making templet

source is usually behind the workpiece, projecting a dark image that makes comparison with a drawing or viewing through a microscope quite difficult.

If you employ the second or third grinding technique and are not able to grind the entire contour in one setup, you'll find it extremely difficult to relocate the workpiece exactly for further grinding.

Grinding split die blocks

Years ago, while working in a precision instrument factory in Germany, I had a hand in developing a profile grinding technique which eliminated the disadvantages just described. Though not new, and although it has proved its value in hundreds of cases (especially in grinding split die blocks and lathe and screw-machine tools), this technique is not widely known or used.

Let's take a typical split die block such as that at the top of page 134 and follow each step in its production.

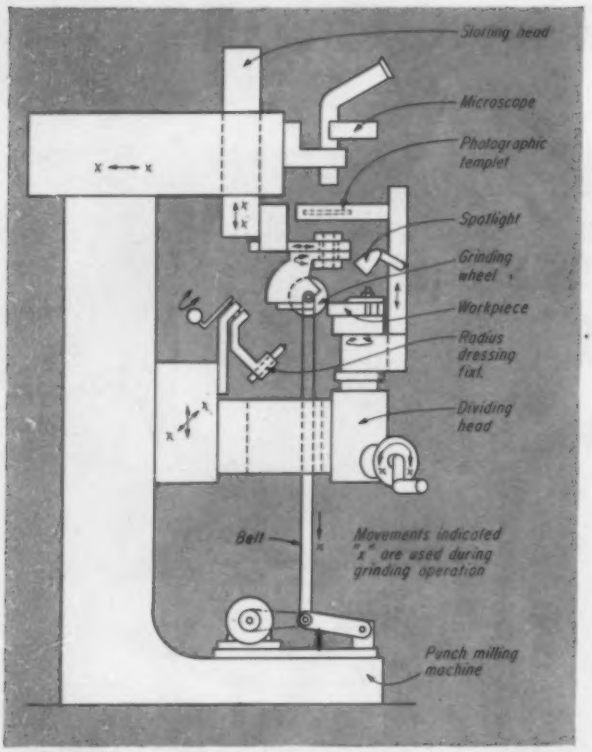
First, an enlarged, 10:1 scale drawing (as shown above) is made with black ink on a special laminated paper, which consists of two layers of white paper surrounding a central layer of aluminum. The aluminum minimizes the effects upon the paper of humidity and temperature. All lines are drawn 0.006 in. wide, and the contour is drawn to the plus side of the part tolerance.

To aid in getting exact photographic reduction, we add a 20-inch-diameter reference circle to the drawing. (The reproduction scale and the reference circle diameter can be chosen to suit the photographic setup available.)

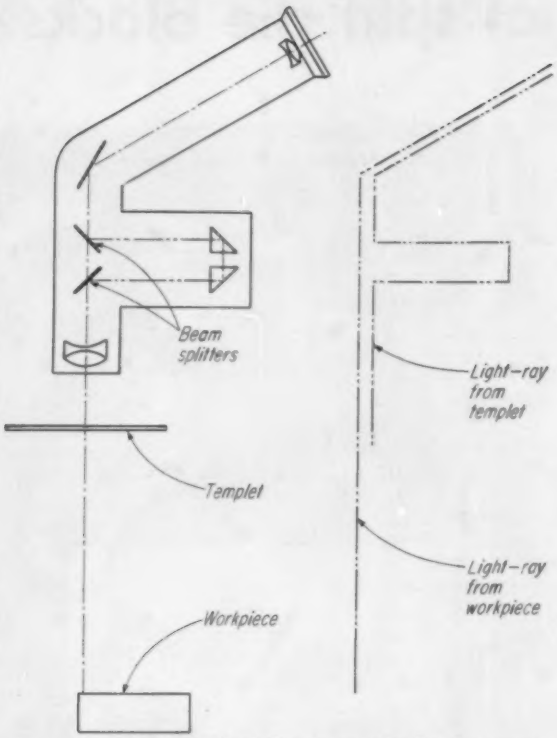
Photographic reduction

The finished drawing is then photographically reduced to the actual die size, as in the sketch above. To assure getting the exact reduction required, we substitute an etched glass plate for the photographic plate in the camera. This glass plate carries a set of guide lines within which the image of the reference circle must fall if we are to get proper reduction. This is checked with a small microscope that slides across the back of the camera.

We then remove the glass plate, put back the photographic plate, and



Profile grinding is done on modified Deckel FP 1 universal punch milling machine. Dividing head assures accurate mating of split lines. For optimum performance, machine is in an isolated room



Optical system of grinding setup provides the operator with a right-side-up image of the contour projected onto the workpiece. Magnification is 20X

expose it. With the drawing illuminated by two 1000-watt lamps, the exposure (on extra-fine-grain emulsion) is about one second.

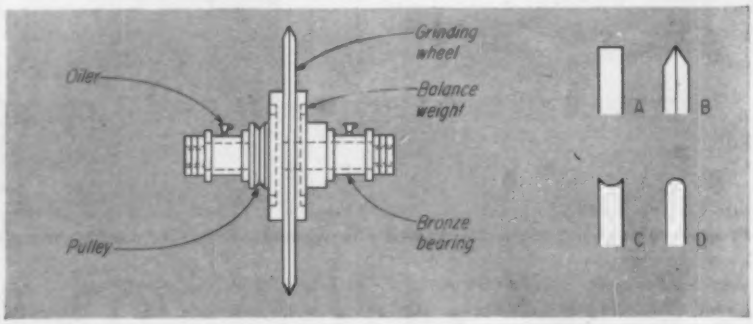
The resulting line width on the negative is between 0.0008 and 0.001 in. From this negative, contact copies are made on glass plates. (We use a small vacuum pump to make sure that no air is trapped between the negative and the plate, for this would cause distortion in the final templet.) These contact copies now represent exact, full-size replicas of the drawing. They are round, about 3 inches in diameter, to permit rotation and centering in the grinding fixture.

The grinding operation

Grinding is done on a modified Deckel FP 1 punch milling machine (top, left). The optics of this system are so arranged that when the operator looks into the 20X microscope he sees a right-side-up image of the part projected onto the workpiece. A condenser lamp, similar to that used in a 35-mm slide projector, provides illumination of the working area.

Because the relationship between the photographic templet and the workpiece is fixed, and since the microscope moves in conjunction with the grinding wheel in the X and Y axis, no crosswires are necessary and the entire contour can be ground in one setup.

The operator works to the inside of the projected contour. To assure positive mating of the split lines, a dividing head moves the workpiece through the required arcs.

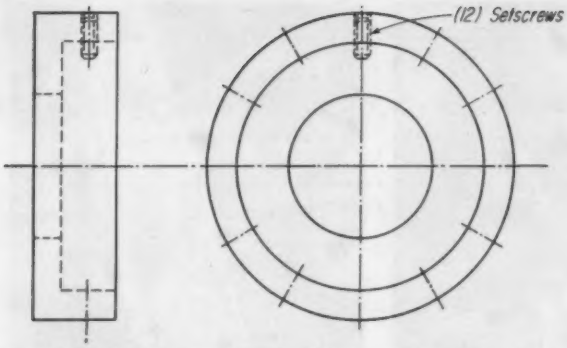


Grinding wheel assembly and typical grinding wheel shapes

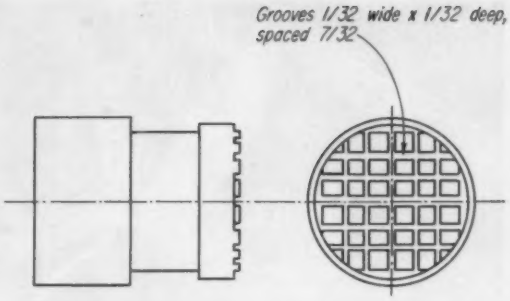
Grinding wheels

The grinding wheel (about 5 inches in diameter) rotates at 5300 rpm, giving a cutting speed of approximately 7000 sfpm. For grinding high-carbon, high-chrome steel we use a 240-grain, grade J, aluminum-oxide wheel. With a different wheel and at a different speed, we have also ground carbide die blocks.

Inside and outside radii are formed by plunge-cut grinding with a wheel dressed to the required radius. A grinding wheel assembly and some of the more common wheel shapes are shown above. Instead of dismantling a wheel assembly every time we want to change wheels, we keep at least four complete wheel assemblies on hand, and simply replace the whole assembly.



Centering fixture positions die block segments prior to grinding of OD of the block on a cylindrical grinder



Grinding pad is cemented to the die block segments to hold them is position during grinding of OD of the block

After all die sections have been ground to contour, they are centered in the fixture shown above (left) and cemented with shellac to the grinding pad (above, right), which is inserted through the hole in the bottom of the centering fixture. We now remove the centering fixture and place the die block (which is still cemented to the grinding pad) on a cylindrical grinder, so as to grind the OD of the block. Additional clamping pressure is provided during grinding by a rubber pad fastened to the tailstock of the cylindrical grinder.

The OD of the die block is ground with a back taper of 0.05 in./in. to provide for a press fit into the chase. When the block has been pressed into the chase, the grinding pad is removed, and the job is complete.

If the job has been done carefully, the die block will require no touch-up whatsoever; surface finish will be about 80 microinches, and dimensions will be within 0.0005 in. •

Capitalize your training costs

American industry will spend billions of dollars this year for industrial training. And the outlay will become even greater in future years, for it has been estimated that industry will have to develop and upgrade some 6,000,000 skilled workers during the Sixties.

Obviously, the expenditure of such sums requires serious thought. So said George S Odiorne, professor of industrial relations, University of Michigan, and keynote speaker at the 17th annual conference of the American Society of Training Directors (Philadelphia, May 2-4). He also asserted that we must do some hard thinking about:

- How on-the-job training and manpower development contribute to economic growth, profit, and survival of a company
- When training is a capital investment and when merely an expense of doing business
- How to tighten the planning of training programs.

He also urged better budgeting concepts to meet training needs for more people and more advanced or new skills. Budgets for training can be divided into expense budgets or capital budgets. Expense items—those for which we expect return in the immediate accounting period—would include work simplification, sales techniques, quality control, safety training, cost reduction and control, operative procedures, and operator skill training.

Capital investment

Training expenditures that would, and should, be considered capital investments include upgrading and "creating" 6,000,000 skilled workers during the Sixties, and the upgrading of 4,000,000 managerial people in the same period.

Tax allowances for the anticipated vast investment in human capital could have an immense effect upon accelerating the rate of training. The timing of training expenses is important, too. That part of training expenses that is a capital expense might receive more realistic appraisal during bad times if its relationship to economic growth is better understood.

Machinery group meets

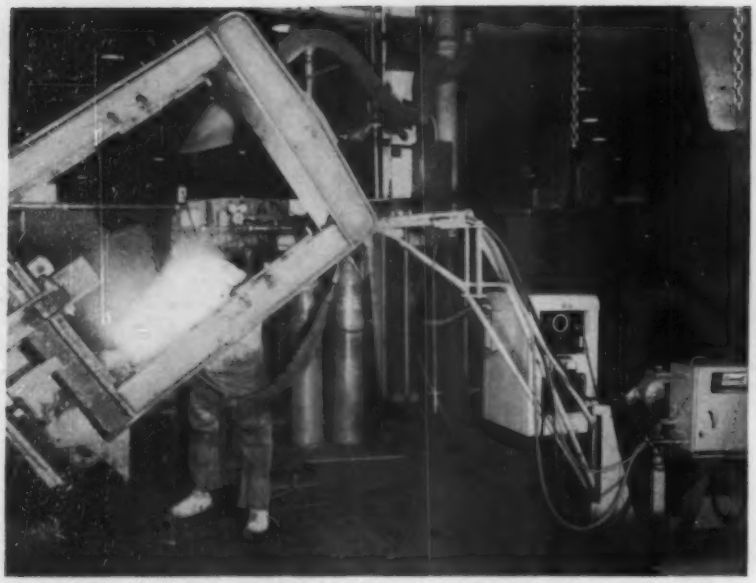
For the first time, a pre-conference meeting was scheduled in the ASTD conference for a group from the "machinery manufacturing" industry. A M Casselman, director of in-plant training of Cincinnati Milling Machine Co's Technical Training Center, served as chairman.

At the meeting Richard E Silver, supervisor of manufacturing training at Minneapolis-Honeywell's Microswitch Division, described his efforts to apply audio-visual in-plant training. His tape and slide topics are designed for use by the foreman in training workers, and can be used by the worker at his bench or machine.

To prepare the topics Silver, who has had broad shop training, and an industrial engineer discuss a training project with the foreman. Polaroid shots are made of the various sequences. These are then used for discussion with the foreman, the conversations being taped.

Now, with rough material ready, a coherent presentation is developed. Slides are made by a secretary (preferably one with some art training), and Varityped instructions are added to the slides. Necessary photographs are re-shot and tapes are edited.

The final result is an effective training tool that meets shop needs yet costs only a fraction of a professionally made slide-film. •



Swinging boom holds cables and hoses where the operator needs them and protects them by keeping them off the floor. Control unit (right) feeds electrode wire and CO_2 to torch at preset rates; operator merely guides the torch

Welding bridges gaps caused by liberal fit-up tolerances between stiffeners and channels made of ⅝-in. plate

Mig welder boosts arc time

By Frank Kopczyk, welding engineer,
International Harvester Co,
in collaboration with other IH engineers

The key to production economy is more efficient application of equipment and manpower. In welding, this means either increased arc time or higher welding speeds—or both. We gained in both ways at our Chicago Tractor Works by switching from manual "stick" welding to semiautomatic welding for radiator guards (above) made of heavy plate.

The guards protect the radiator cores and cooling-system pumps on the TD-25, the company's largest earthmoving tractor. They also serve as a fluid reservoir for the hydraulic system, so the welds must be tight.

Welds with hand gun

Semiautomatic welding, of course, is welding with a hand gun that feeds wire filler metal as the operator moves the gun along the joint. The equipment we selected for this job is the Dual Shield process produced by the National Cylinder Gas Division of Chemetron Corp.

The process employs a flux-cored electrode wire, and also shields the arc with carbon dioxide. Both the electrode and the CO_2 are fed through the water-cooled welding gun at preset rates governed by an electrical control unit.

For the welding job on our radiator guards, the parts are first tacked together with stick electrodes. Depending on the model, the guards have as many as 25 parts and subassemblies.

Then the unit is mounted in a positioner at one of the semiautomatic stations. Each station has its own constant-potential welding machine (DCRP), a Dual Shield control unit, and CO_2 supplied from cylinders.

All electrical cables and hose (for CO_2, cooling water, and electrode) are mounted on a swinging boom for their protection and for the operator's convenience. With the electrode-feed rate preset on the control unit, the operator merely positions his gun over the joint, strikes his arc, and welds.

There are more than 1000 in. of downhand and horizontal ¼-in. fillet welds, or equivalent, on the larger guards. Fillets up to and including ⅜ in. are welded in one pass; those between ⅜ and ¾ in., in two passes. Feed rate for the 3/32-in.-dia electrode ranges from 150 to 180 ipm, which deposits 13 to 15 lb per hr.

Some indication of the increased speed of this semiautomatic process is given by the following example. Assume a wire melt-off rate of 9 ipm for conventional ¼-in.-dia E-6012 stick electrodes and a rate of 150 ipm for the 3/32-in. flux-cored electrode. At these rates, the arc time for a given weld is cut to less than half.

This calculation ignores the time required for welding rod changes during stick welding, and also ignores positioning time. Therefore, it doesn't reflect actual overall production savings, but the savings in arc time are significant.

Bridges wide gaps

Because of its excellent bridging ability, the process is also welding parts where relatively close gap tolerances are difficult to maintain. It can easily bridge gaps up to 3/32 in.

A typical example is the assembly of tractor-engine side channels. After these channels are flame cut from heavy flat plate, they are sheared and press-formed. Then stiffeners are welded inside to give the channels additional strength and rigidity.

With plate thicknesses up to ¾ in., fit-up tolerances between the channels and stiffeners are necessarily liberal. However, as shown above, the flux-cored electrode is solving this problem successfully. •

How energy-rate replaces force in exotic processes

A new look at the principles behind conventional metalworking and the new high-energy-rate processes. How unusual capabilities result as the rate of energy release is increased in these forerunners of tomorrow's tools.

By William M Stocker, Jr,
senior associate editor

Developing rapidly out of the demands of modern metalworking are a host of new "exotic" processes. When compared with conventional shop practice, these techniques seem "way out." Nevertheless, they are significant tools for today's and, especially, tomorrow's manufacturing capability.

Electrical-discharge and electrolytic machining, flow plating, chemical milling, electron-beam cutting and welding, plasma cutting and welding, ultrasonic machining, and explosive or magnetic forming are names to conjure with. Each name describes a specific metalworking process. But what makes them important?

Why are these processes distinctly different from the methods we consider conventional? The differences are numerous but perhaps the key word to define this area of tool development is "energy."

Force vs energy rate

Conventional metalforming and metal-removing processes traditionally have manipulated force at limited speeds (the rpm of a lathe or the ram speed of a press) to accomplish their purposes. Now the emphasis is on the rate of energy release.

All work is done by the transfer of energy from one object (or storage medium) to another—from a hammer to a nailhead, from one electrode to another, or from a die in a press to a sheet of metal—which results as a "force moving through a distance." However, a swift kick is more shocking than a slow, sturdy push—even though the total power is identical.

Energy is basic. While it can be neither created nor destroyed, it can be accumulated and stored in a variety of ways and media. Energy, depending upon this media, can be controlled—for release where and when desired. *Power* is determined by the *rate* at which a given quantity of energy is released.

Traditionally, metalworking processes have depended upon mechanical energy to remove chips or form sheets—with the emphasis on force. However, we have learned in recent years that force alone is not as important to working metals as the rate at which the force is applied.

One of the fundamentals of physics is that Force = Mass times Acceleration ($F = MA$), while Energy = ½ Mass times Velocity squared ($E = \frac{1}{2}MV^2$).

Forces generated by the mechanical energy transmitted through a lathe, for example, are limited by the velocity at which the mass (weight) of the work, the workholder, the spindle, etc, can be rotated. Also, there is a limit to the ability of the cutting tool and its holder to withstand these forces. Similarly, there is a limit to the speed at which a press ram can be operated—and stopped.

Both the energy and the power transmitted by the 50,000-ton press are tremendous but the energy is applied to a large area of work and the large mass of the ram and die establish a relatively slow rate of energy release. This rate is too slow to create the "shock wave" now recognized as a valuable phenomenon in metalworking. *Increasing velocity will build up energy far more rapidly than will increased weight.*

Efforts to achieve these high velocities with mechanical energy have included the high-speed machining research at Lockheed (AM—Feb 22 '60, p. 111) and the Dynapak machine developed by Convair (AM—Nov 17 '58, p. 123). At Lockheed a projectile, as the workpiece, was fired past the cutting tool—to give velocities above 250,000 sfpm.

The Dynapak machine uses a unique system for rapidly releasing accumulated hydraulic pressure. Another machine tool aimed at replacing mass with velocity, or supplying higher velocity to the tools, is Chambersburg Engineering's "Impacter."

While each of these machines has demonstrated significant metalworking advantages, none of them has produced the high rate of energy release obtained from the chemical and electrical sources. For accuracy, the so-called "high-energy" processes would be better defined as "high-energy-rate" processes. Time is their common denominator.

When forces are generated by electrical energy and converted directly into work, only the minute mass of the electron need be reckoned with and the velocity can, theoretically, approach the speed of light. Now the problem is simply to get enough electrons to work simultaneously in the desired area, remembering that they shun each other. The energy potential can be tremendous, with efficient delivery in less than a microsecond.

Chemical or heat energy stored in the molecules of a gas, such as steam, or the product of rapid burning, is only slightly dependent upon the small mass of the molecule. Thus the highly energized molecules will rapidly accelerate to very high velocities (explosion) when released. This energy can be delivered almost instantaneously—again in microseconds or less—upon contact with the workpiece.

Finally, it is possible to combine the molecules of a gas with electrical energy to form ions—and we call the resulting material "plasma." Now we must recognize a new form of matter —solid, liquid, gas, and *plasma*. Plasma isn't a "gas" because it doesn't obey the gas laws; also it conducts electricity and is electromagnetic.

A super energy source

Energy potentials for plasma are fantastic because the mass of the molecule, which is many thousands of times that of the electron, is readily accelerated to velocities approaching those of the electrons. Electromagnetic fields can be used to increase this acceleration.

All of this energy is released on contact with a target, or workpiece.

Temperatures of 30,000 to 50,000 F have been achieved. Temperatures exceeding 200,000 F are anticipated for industrial use. A temperature of several million degrees has been reached, for a brief period in the laboratory.

Because of the velocities to which plasma can be accelerated, it also is used to produce the Mach 10, and higher, speeds needed in hypersonic "wind tunnels." Furthermore, plasma is the product of the "ion rocket" for long-distance travel in space.

(Actually, scientists recently discovered that plasma is formed when substances such as dynamite explode. It persists for several microseconds, until the energy is given up to heat the surrounding gas. Formation of plasma may account for the difference in "explosive" rate between, for instance, black powder and dynamite.)

$$\text{Power} = \frac{\text{Work}}{\text{Time}}, \text{ or}$$

$$\frac{\text{Energy (released)}}{\text{Time}}$$

If you think of Power as a rectangle in which Energy is one side and Time is the adjacent side, you will see that the same quantity (area) of power can be delivered by increasing Energy and decreasing Time, or vice versa. However, the new metalforming processes require high impact. Relatively large quantities of energy are released in very short periods of time. The effect is that of much more power than is actually used.

New look at metals

Why does this phenomenon occur? To understand the exotic processes, you must view the metal to be worked as a collection of atoms, each atom containing its own electrons, rather than as a solid block or sheet. The high-energy-rate processes work on the individual atoms of material rather than on the whole unit.

Remember that the seemingly solid block of metal also is composed largely of energy—with a nebulous, formless, something, that gives all things form, working within and between the atoms and molecules.

When conventional forming processes are used, the force is applied over the entire area of the work. Also, because of the rate of energy application, the force is transmitted through the work so that the total mass of the workpiece resists deformation.

On the other hand, if the energy is applied to an area of the workpiece at a sufficiently high rate, it does its work progressively—before the remainder of the workpiece can resist. You might say it works so fast that one side of a sheet is completed before the other side knows what is going on. To accomplish this feat, the energy must be released at a rate which creates a *shock wave* in the metal.

Some researchers theorize that as the shock wave moves through the work material the zone it affects at any moment becomes, for that instant, virtually fluid. This, they say, explains why hardened metal can be deformed without cracking; why tungsten can be extruded. (Applying shock waves from opposite sides of a metal block will crack the block where they meet within it. Even a thin sheet can be split in this way.)

What has this to do with metalworking? More than most people realize, it is a new concept in which the energy which binds atoms and molecules into a solid is overcome by energy rather than by mechanically applied force. At present the electron appears to be most promising. It is basic and can be applied in a variety of ways. By using electrical techniques, magnetic forces can provide effective tools. Chemical, and electrochemical, methods also offer an ever-widening scope of unique capabilities.

Evolution will be slow. These tools will not replace the edgetool overnight, and in many cases not at all, but don't ignore their future promise—nor even their value today. Energy is the wondertool of tomorrow. •

Six-step preventive maintenance program saves GE $30,000 a year

A six-step program, started in 1958, today gives General Electric's Large Motor and Generator Dept (Schenectady, NY) a maintenance system that saves $30,000 a year.

Maintenance is no small job at LM&G: 75 full-time workers service machine tools and related equipment in six buildings that contain 850,000 sq ft of production facilities. (That's the size of 18 football fields).

Although the old program was effective, the new one further decreases machine downtime, increases the efficiency of maintenance workers, and makes for better day-to-day care of equipment.

Here are the six steps, as reported by Charles A Fenton, supervisor of maintenance:

• **Inventory of equipment and spare parts.** During this inventory, machine specifications also were obtained. To ensure future identification, a metal tag was attached to each spare part. The inventory covered about 2400 items, including 1088 machine tools.

• **Centralized maintenance file.** The new setup combines, in one easily accessible file, information on equipment specs, spare parts, maintenance histories and schedules, and other pertinent subjects.

Set up so that foremen, engineers, planners, and maintenance people can consult it easily, the file contains four cards for each piece of catalogued equipment: a data card, machine specification card, preventive maintenance order card, and spare parts card.

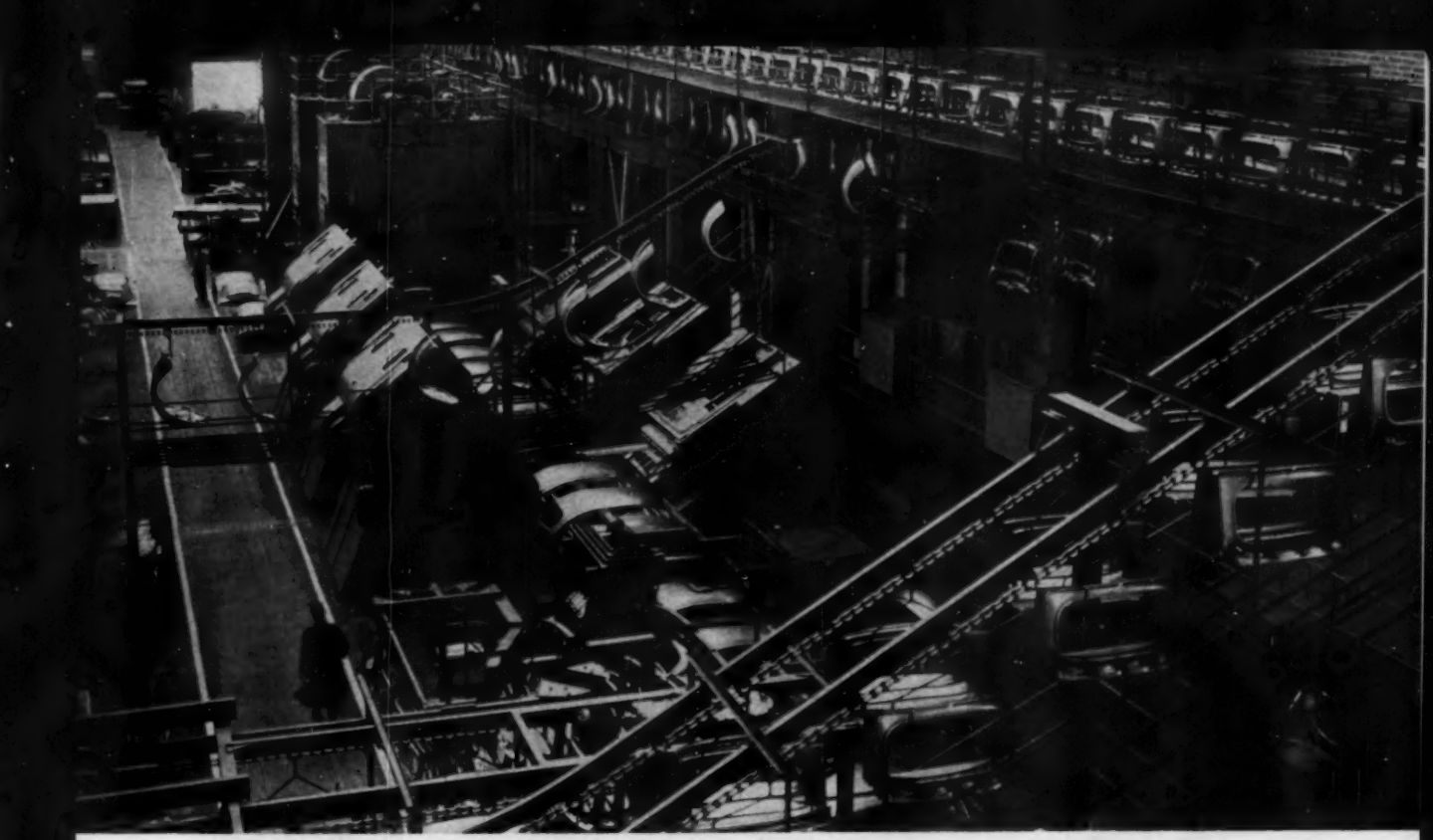
One secretary keeps this file up to date. She also operates an electronic call system that locates maintenance people in one-fourth the time it used to take.

• **Lubrication system.** Statistics show that 75% of all machine breakdowns come from improper lubrication. The new setup improves equipment lubrication in several ways: standards for lubricants have been set up; there is a color code for lube oils; decals on each fitting ensure the use of the right lubricant; and up-to-date equipment—such as a power-operated lubrication wagon, air-operated oil-dispensing stations, and an automatic conveyor lubricator—have been installed.

• **Planning and scheduling of maintenance.** Naturally, much equipment requires regular maintenance: air compressors, machine tools, motor-generator sets, and the like. This work is planned and scheduled on the maintenance-order card in the central file. Copies of this go to foremen, who turn them over to maintenance men. When work is completed, data on parts used and time consumed go to the maintenance clerk, who enters the expenditures on the data card.

• **Machine cleaning.** Each type of machine is cleaned at regular intervals, either by the machine operator or a maintenance worker.

• **Machine capabilities checks.** These are being set up on an annual basis, and a record will be kept in the central file. •



Most dramatic of the six press lines at Wolfsburg produces a complete Volkswagen roof (with braces and fittings welded in place) at the rate of one every 20 seconds. Production lines like this are . . .

The "Secret" of Volkswagen

By Anderson Ashburn,
managing editor

It took 700 working hours to produce a Volkswagen in 1948 when Heinz Nordhoff became director general and set a goal of 100 hours per car. Now it takes about 60 hours.

Highlights of the manufacturing operation include:

- Highly automated press lines with integrated welding stations.
- An unusually efficient foundry to shell mold cylinders and to die cast magnesium, aluminum, and zinc.
- Transfer lines to machine the magnesium crankcase (undoubtedly the first transfer lines ever developed for magnesium).
- Extensive use of circular production lines (called "roundabouts") for both assembly and inspection.

Today there are 36,000 employees in the plant at Wolfsburg where 3200 Volkswagens a day are assembled. This work force is divided into 55% direct labor, 35% indirect labor, and 10% office force. The plant works two shifts (5:30 to 2:00 and 2:00 to 10:30, with a half hour for lunch in each case).

From these figures it can be calculated that there are 48 direct labor hours per car at Wolfsburg today. However, if we include the other plants in West Germany producing the VW truck (about 800 a day), and engines, axles, and transmissions, the figure rises to about 70 hours per car. Because these plants all produce components for assembly plants in other countries (Belgium, Ireland, Mexico, Brazil, South Africa, the Philippines, New Zealand, and Australia) the actual figure is well below 70—and well below the 100-hour goal set by Nordhoff.

Only US, German machines

To achieve this, the production planning staff at Volkswagenwerk (which is much larger than the product design staff) directed by production manager Otto Hoehne has developed production lines that include the most modern equipment made by U S and West German firms. These are combined with much special welding and handling equipment designed at VW.

Nordhoff stated recently that VW will buy only German and U S machine tools and that the firm will buy U S tools only when they have been made in the home plants, not those built abroad.

Otto Hoehne (left), production manager of VW plants in West Germany, talks with AM/MM's managing editor. The author was in Wolfsburg to study VW operations for this first-hand report

Final inspection on the roof line is visual inspection top and bottom. Mirrors below the line show underside to inspectors

Despite the relatively modern condition of most of the equipment, the plants are continually being modernized. Within the past six months, VW has ordered $1.2 million of U S machine tools for *replacement*, according to Hoehne.

Volkswagenwerk in West Germany consists of:

• **Wolfsburg.** This main plant has 20 million square feet of plant space and a 14-story administration building. It employs 36,000 in a town that has grown to 60,000. Many of the workers moved from East Germany (six miles away) before the border was closed; many commute long distances by car. Production: 3200 VW's a day.

• **Hanover.** Two new plants just off the autobahn, 50 miles west of Wolfsburg. One produces about 800 transporters a day and the other turns out 4000 engines a day. Now has 18,000 workers.

• **Brunswick.** A relatively small new plant 18 miles south of Wolfsburg produces front axles. About 3500 workers.

• **Cassel.** The fastest growing plant today is 115 miles southwest of Wolfsburg. When the new engine was introduced, the old engine lines were moved here to produce spare parts. Also produces the new transmission and other spare parts. About 6000 workers.

Press lines

Six highly automated press lines are included in the Wolfsburg plant and two more are now being installed for the new model. Most spectacular is the roof line (see page 141) which starts with a 1000-ton Clearing press that draws the roof.

When the panel leaves the press it goes through a turnover fixture and into a trim press. Induction heaters stress relieve the front corners just before the third Clearing press, which completes the forming.

The conveyor then leads through three pairs of inclined presses. The first pair punches out front and rear windows and the holes for engine cooling. The second pair sizes the openings and forms the cooling louvers. The third pair punches holes for windshield wipers in the front and completes the folding of the louvers in the rear.

Next there is an automatic welding station at which braces and fittings are welded into place. Finally the roof passes a brightly lighted inspection station where visual inspection is made of the forming and welding operations. Mirrors placed below the line permit the inspectors to see the underside of the roof.

A typical example of one of the other press lines is the front fender line. Here, blanks for both front fenders and headlight housings are cut from a single steel sheet. The small amount of scrap remaining falls through the bed to the underfloor conveyor that carries it to the baling press.

Sheets are loaded into the blanking press automatically. The headlight blanks slide out by gravity and the fender blanks are removed by Iron Hands.

Use of check points

Three Danly presses in a line produce the fenders. The first forms one fender in a single draw, the second forms the other. A conveyor carries fenders from the first press around the second one. The third press blanks headlight openings in both fenders at once.

Meantime, the smaller headlight housing blanks have been trucked to the other end of the line. They are formed and trimmed and meet the

fenders at the center of the line where a welding station assembles housings to fenders.

On most of the press lines there is a check point at the head of the line, with a panel board showing the operation of each press, handling device, and welding station.

Troubles show on board

If the line goes out for any reason, the trouble point shows up immediately on this board and the checker records the time, length of stop, and reason in the log book. Study of these logs helps production engineering find weak points in the line and work on ways to eliminate them.

In the new press plant at Hanover, there appears to be less use of automatic loading devices than at Wolfsburg, but automatic unloading devices are virtually universal.

On presses that are hand loaded it is customary to set the press to cycle continuously. The press is then equipped with a row of photo-electric cells and a row of lights on opposit sides of the loading area. When the operator breaks the light beam in the act of loading the press, this stops the ram. When the operator removes his hands the cycle starts.

Assembly roundabouts

Assembly of the unitized body starts with two merry-go-round fixtures, one for the rear body and one for the front.

All parts are loaded by hand at fitting out stations on the roundabouts. In this case the workers must press buttons that indicate the station is clear. All stations must be clear for the fixture to index.

The 8-station front-end roundabout was built first. The fixture is not sunk in a pit, but is built above floor level, so that the working platfrom is 10 ft above the floor.

Each of the welding stations consists of welding heads on hydraulic rams that move into the fixture from the bottom and the elevated struc-

The Volkswagen Story

The remarkable history of Volkswagen is essentially the story of Ferdinand Porsche, who conceived the car; of Adolf Hitler, who started a plant and a town to build it; and Heinz Nordhoff, who turned Porsche's dream into reality.

Porsche began designing the car in 1931 and by the mid-thirties it was the laughing stock of the German auto industry. But it fitted Hitler's plans for a "Strength-through-joy car."

Hitler laid the cornerstone of the plant on May 26, 1938 — and 320,000 Germans dutifully bought savings stamps and pasted them into stamp books that would entitle them to cars.

In 1940 the plant started production—but it was production of military vehicles. Altogether 70,000 military Volkswagens were produced during the war plus assorted bomber and mine parts. By 1945, 60% of the plant had been destroyed by bombs.

American troops advancing to the East stopped six miles short of the "Strength-through-joy town" which did not show on their maps. Four men—a displaced French priest, a German-American from Detroit who had joined the company before the war, and two local workers—approached the first patrol and asked the GI's to occupy the town before the revolting slave laborers destroyed it. Thus the front was moved six miles east of the town.

Four weeks later town and plant became part of the British Zone. The British commander renamed the town Wolfsburg after a historic mansion on the outskirts that was serving as headquarters.

Some Volkswagen engineers drifted back seeking their personal belongings and were offered jobs repairing British vehicles. A few cars were assembled from parts lying about.

The plant was offered to the occupation authorities of each Allied nation as reparations: No one had a high opinion of Porsche's car; no one wanted it. So the plant was returned to the German government. In 1945, 1785 cars were produced. In the next year, 10,000. But in 1947 production fell to less than 9000. Apparently the stocks of parts were running low.

Then on January 1, 1948, Heinz Nordhoff came to Volkswagenwerk. The son of a bank clerk in Lower Saxony, Nordhoff was wounded in World War I, studied at Berlin Technical College, was an apprentice at Bavarian Motor Works, and joined Opel (the General Motors subsidiary) in 1929 to write service manuals. By 1940 he was head of the new Opel truck plant at Brandenburg. When the Russians overran the plant he fled to the West.

Col Radclyffe, chief of the industrial department for the British Forces, offered him the job of managing VW. Nordhoff declined. He wanted to go back to Opel. Then the Americans, angry because German military vehicles had been built in US-owned plants, informed him he could not work for Opel and would only be allowed to do manual labor in the American Zone. Reluctantly, Nordhoff took the VW job.

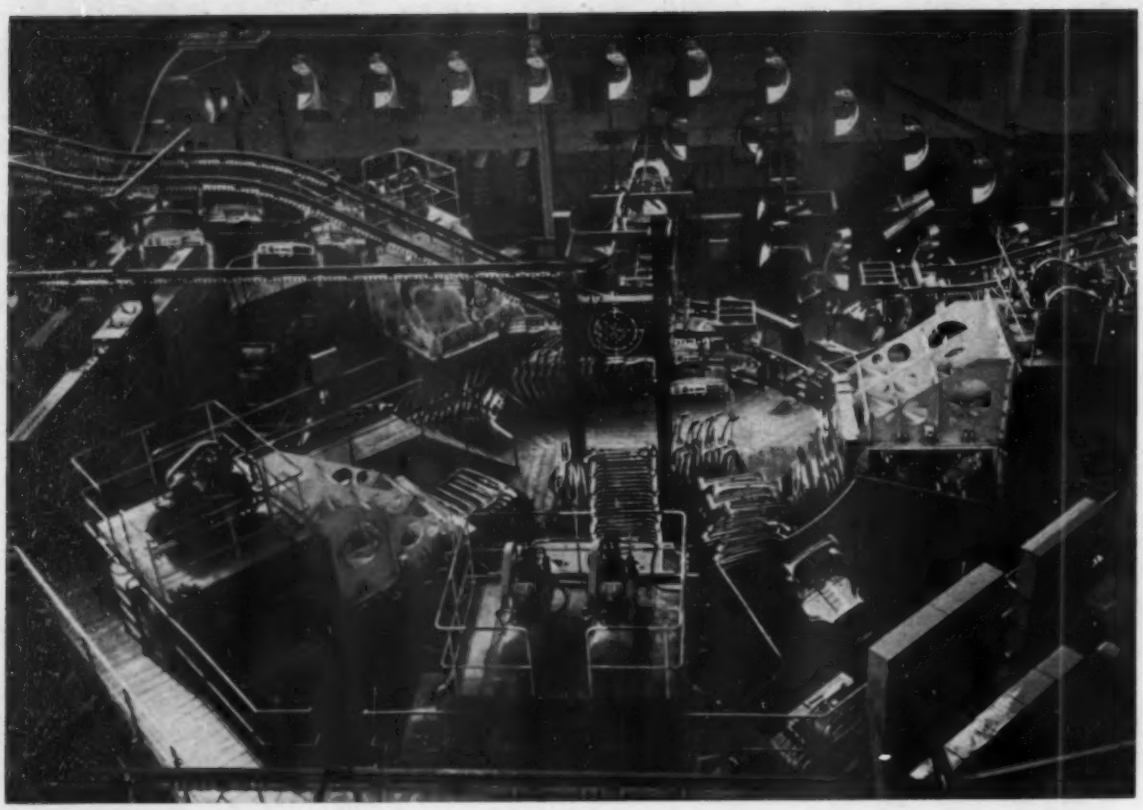
The rest is history. With no Marshall Plan aid and no aid from the West German government other than the right to plow 100% of profits into expansion, Volkswagenwerk had grown to a gross volume of 4,500 million DM ($1.1 billion) by 1960.

Early this year 60% of the stock was offered to the public. Individuals could buy 5 shares each and employees of VW earning less than $4000 a year could buy 10 shares each. When the stock seemed to be moving too slowly, a new model (to be introduced later this year) was announced. The issue was oversubscribed.

Constitutionality of the stock sale has been challenged and is in the courts. The guessing in Wolfsburg is that the sale will go through with employees receiving 7 shares each, the public 3 shares.

Another court case has plagued VW for a decade: those 320,000 stamp savers want their cars. VW has offered a price reduction of $125 or a cash settlement of $67.50. This has been refused by the Ex-Savers' Association.

Money from the stock sale and the share of dividends (which VW will now have to pay) that go to the 40% of the stock retained by the German Federal Republic and the State of Lower Saxony will all go to the new Volkswagenwerk Foundation. Patterned after the Carnegie, Rockefeller, and Ford foundations, this will promote scientific research and the teaching of science.



Large rotating fixture, called a roundabout, is for assembly of front end of VW. Four spot-welding machines, three parts loading stations, and an unloading station make up the fixture. Light panel in center shows status of each station

Weld heads below welding station lift hydraulically, raising assembly jig into upper welding head to spotweld. An average of more than 60 individual welds are made at each station

ture makes these bottom rams readily accessible for maintenance.

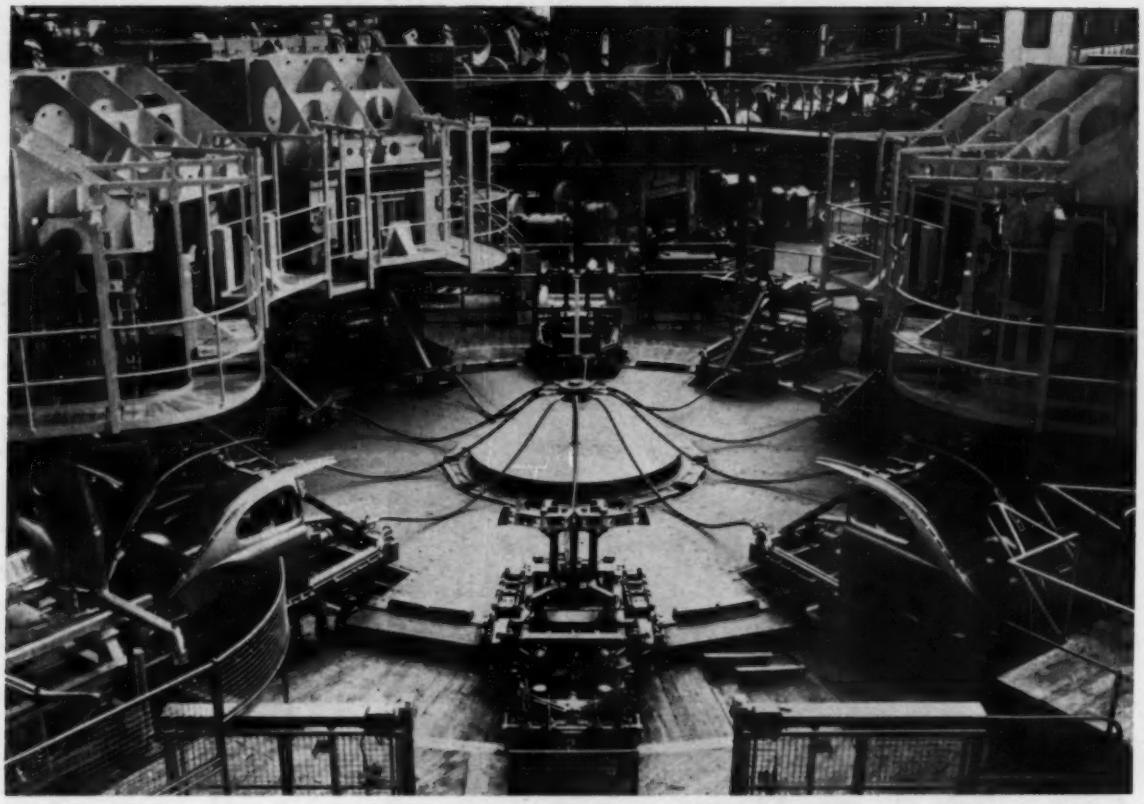
The 10-station rear-end roundabout is newer and incorporates many points of improvement developed from experience with the first one. One of the most notable is the provision for quick change of the hydraulic units, with spare hydraulic units at each station.

All the welding equipment for these roundabouts was designed by the production planning department at VW and built by Voigt & Haffner in Frankfurt-on-Main.

Dipped in primer

Assembled unit bodies go to the paint shop with fenders (which will later be bolted on) attached by temporary means that permit both body and fenders to be painted all over.

The body goes through a cleaning and bonderizing tank and then to the paint lines. First the body is completely immersed in a tank of primer. To eliminate the air bubble that would collect under the roof, a vent pipe protrudes from the center of the tank of paint. As the body is



Rear-body roundabout rotates counterclockwise (reverse of the front-body fixture), starting at first loading station in the foreground and ending at automatic unloading station just to the left. Enough spares to last 4 hours are held nearby

lowered into the tank, this pipe retracts into the paint with the body. It lets air out as the car is lowered, and then lets it back in as the car is lifted. This coat is followed by an 8 min bake at 320 F.

The second and third coats of paint are applied by Ransburg electrostatic equipment with cam-programed heads that follow the contour of the car. Both coats are followed by a 20 min bake at 285 F.

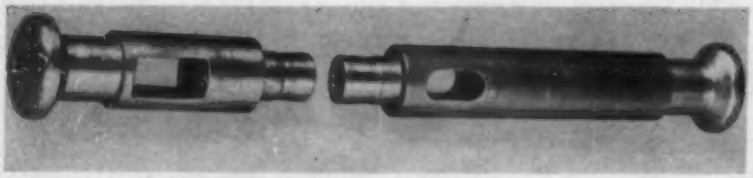
The finish coat is then applied by hand spray (this is the only color coat applied, and the car is currently produced in seven colors) followed by a 20 min bake at 265 F.

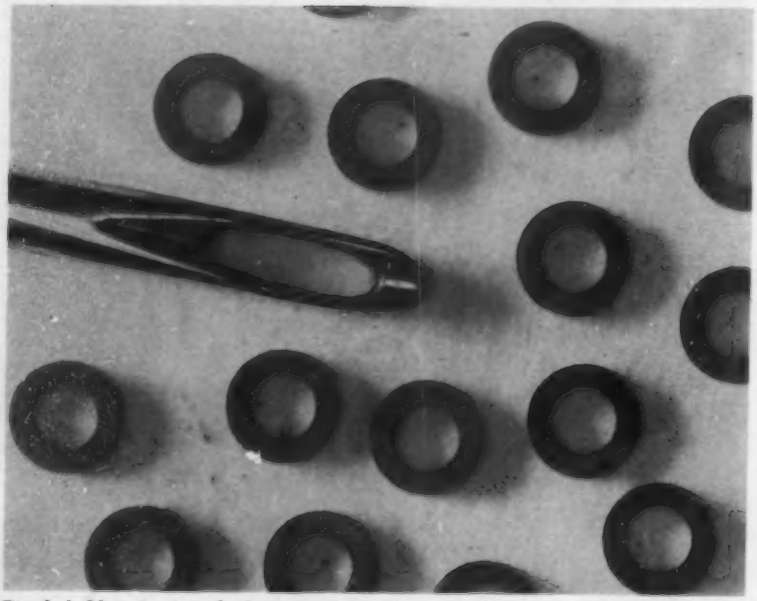
In final assembly at Wolfsburg there are five parallel assembly lines for fitting out the body and six assembly lines for the chassis. The fitted bodies are dropped on the chassis of the Volkswagen and attached by 32 bolts.

The extra assembly line for chassis is for the Karmann Ghia and convertible. Volkswagen does not build these bodies. They are made by Karmanns in Osnabruck and the chassis are shipped there. •

Two teams of men work in rotation to fit parts to fixture at first station. The fixture then goes through another fitting station, two welding stations, two more fitting stations, and then three welding stations. Total is 318 individual spotwelds

Tableting with tungsten





Punch holders (top) made from Hi Wear 64 outlast those made from high-carbon high-chrome steels 12 to 1 in tableting press (center) for making tiny (as many as a million per machine) magnetic cores shown with ordinary needle in bottom photo

Under the toughest of conditions, service life of tableting press punch holders has been increased as much as twelvefold by making them of Hi Wear 64, a new tungsten tool steel.

The Hi Wear 64 punch holders have proved themselves superior to conventional high-carbon, high-chrome punch holders in exacting tests at IBM Corp's Poughkeepsie, N Y, plant

For one thing, they are used in tableting presses which compact an extremely abrasive material—powdered iron oxide. And because lubricating oil interferes with the compacting process, very little of it can be used. The end product is ferrite magnetic cores for memory apparatus in electronic computers.

Evolution of materials

Originally, when made from high-carbon, high-chrome steels, the punch holders lasted from four to six weeks, then had to be replaced because of abrasive wear on the head and side of the shaft.

Not only that, these tools would become so loose they could not be used within the necessary extremely close production tolerances. Galling and seizing would occur, and sometimes the tools would break.

Later, the punch holders were made from Carpenter K-W tool steel, which demonstrated superior wear resistance to that of the high-carbon, high-chrome steel. Production capacity and reliability increased considerably despite the severe wear conditions.

Even so, IBM stayed on the lookout for a better material, and eventually tried Hi Wear 64, an alloy easily handled and dimensionally stable in heat treat.

Some holders made from this material, a wear-resistant steel also made by Carpenter Steel Co (for cold work applications) have since been tested for as long as a year at IBM with no trace of wear.

Output increase of 800%

Furthermore, when the punch holders were made from high-carbon, high-chrome steel, the company used only one tool at a time on a special machine.

Now that Hi Wear 64 has virtually eliminated the problem of wear, IBM now operates eight punches simultaneously on one machine. That's a production capacity increase of 800% per machine! And production

costs are considerably lower than they were before the change in materials.

The machine itself is a tableting press, custom-tailored in many respects to automated production at close tolerances. It has, for example, a micrometer adjustment to control the weight and thickness of the tiny cores, a signaling device in case a punch hangs up, a selector dial and pocket for the product of each punch, a photoelectric cell control which reflects off the work table, and a power feed hopper. The press itself is refinished, to provide precise indexing between the lower and upper punches.

Danger of abrasion

As the press head revolves, some of the abrasive powder flies into the machine—working its way between the shafts of the punch holders and the bearings.

Even the slightest abrasive wear can be disastrous—because the tolerance between punch holder and bearing is only ± 0.0001 in., while the tolerance between the carbide rod and tube forming the core is also ± 0.0001 in. But the parts now last much longer because Hi Wear 64 is much less affected by abrasion.

The magnetic cores have a hole diameter of 0.030 in., an OD of 0.050 in., a thickness of 0.012 in., weighs 1.3 milligrams, and are held within ± 1/10 of a milligram to that weight. After pressing, they are sintered.

The upper and lower punch holders are both made from 1⅛-in. bar stock. The bottom surface of the lower punch holder is only slightly lubricated for movement on a circular track, and a small amount of lubrication is also used on the head and upper shaft of the top spindle. It is important that the tool be able to work with little or no lubrication, because the powder used in forming the cores must remain perfectly dry.

Each tool is precisely turned, milled, drilled, heat treated, cylindrically and jig ground before it is put to use. A diamond wheel jig grinds the hole in the punch to within ± 0.0001 in. concentricity with the OD.

Because of the steel's extreme wear resistance, such grinding is done slowly and carefully, and only 0.010 to 0.015 in. of surface is removed. A 120-grit silicon carbide wheel with 0.0005-in. maximum infeed does the job.

Non-deforming

Hi Wear 64, because of its low hardening temperature and deep hardenability, is essentially a non-deforming tool and die steel, which has little tendency to decarburize and machines at least as well as standard high-carbon, high-chrome steels.

Tools made from it can be hardened in either oil or air (depending upon the mass) without distorting or cracking. Oil hardening produces maximum hardness (Rh 64-65 C after tempering at 350 F) and is recommended when the smallest dimension of the tool is in excess of 1 inch.

Type analysis of Hi Wear 64: carbon 1.50%, manganese 2.00%, silicon 0.25%, chromium 0.90%, molybdenum 1.00%, and tungsten 4.00%. •

Vacuum clamps speed structural welding

Giant suction cups, part of a Scottish-developed clamping device for structural welding, hold two parts together with a force of 2240 lb, eliminating the need for positioning stirrups, which otherwise would have to be tacked into place and removed.

The device not only saves time but overcomes certain stress-concentration problems which occur in clamping and welding of high-tensile steels and aluminum alloys.

When a structural member is to be welded to plate, the operator places one foot of the clamping device on each side of the member—firmly against the plate. The clamp works even on a curved surface, because the feet are joined to the frame with a ball-and-socket connection.

The suction cups, made of synthetic rubber, are protected from arc heat by metal shields. Once they are in position, an electrically driven pump draws a vacuum under the two cups. Then the operator forces the structural member into position against the plate with a manual hydraulic jack located on the cross-piece. The jack has a 9-inch movement.

The pads are standard, 10½ inches in diameter, have 5 clear inches between them, and achieve a 2240-lb thrust. Larger pads (11 x 3¾ in.) provide 3400-lb thrust but clearance is cut to 4 in. The clamping machine, Via-Vac, is manufactured by R Y Pickering & Co Ltd, Wishaw, Lanarkshire, Scotland. •

Suction cups hold portable clamp even in vertical position. Device is positioned astride work, then electric pump draws a vacuum under the cups

220-foot-high stripping shovel (left) has a total reach of over 460 feet, dipper capacity of 115 cubic yards. Internally splined parts for shovel are cut on large (12x11x12-ft, 35-ton) Fellows gear shaper shown above

Giant splines for a giant shovel

Forty-five feet higher than Niagara Falls and weighing about 14 million pounds, the giant stripping shovel shown above is expected to recover coal so deeply buried that it could not otherwise be recovered by strip mining techniques. Claimed to be the largest self-powered mobile land vehicle ever built, the 3850-B stripping shovel has posed quite a few manufacturing problems for its builder, Bucyrus-Erie Co of South Milwaukee, Wisconsin.

Consider, for example, the huge gears and splined parts that go into a shovel of this size. To produce the splined parts, Bucyrus-Erie ordered one of the largest gear shapers ever built by Fellows Gear Shaper Co (Springfield, Vt)—a machine 12 feet long, 11 feet wide, 12 feet high, and weighing about 35 tons.

The Fellows machine is designed specifically to cut internal involute splines on shovel parts, but it can be readily adapted to cut external gears of considerable size. The worktable can handle parts up to 100 in. in diameter and weighing as much as 25,000 pounds.

More than two years will be required to build and erect the 3850-B, and it is estimated that over 250 railroad cars will be needed to ship the components to the mine site. When it swings into action in Western Kentucky for the Peabody Coal Co (St Louis, Mo), this 220-foot-high shovel, with its 115-cubic-yard-capacity dipper, will be capable of removing over 36-million yards of overburden annually. •

NRL boosts magnetic forming output

Brass tubes are being electromagnetically swaged onto coaxial-cable ends two at a time at Naval Research Laboratory, Washington, DC.

The new two-headed electromagnetic swager is an outgrowth of the one originally reported in AMERICAN MACHINIST/METALWORKING MANUFACTURING (Oct 3 '60, p95).

NRL's new swager was born out of necessity. Perfectly formed cable connections, which are almost impossible to produce mechanically, were needed for a joint NRL-AEC fusion project. Sufficient coaxial cable to carry a load current of 25-million amperes (the largest ever reported) from a 2.25-megajoule capacitor bank was required to launch these plasma-physics experiments. So far, over 2500 swaged cables have been turned out by the new swaging machine.

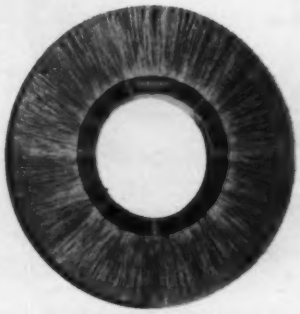
A current of 1-million amperes, tapped off a 50-kilojoule capacitor bank, creates a magnetic field force of 200,000 gauss. This force is focused onto the brass tubes by a doughnut-shaped coil 10 centimeters in diameter, and it takes only eight microseconds for the magnetic force to swage the tubes onto the cable.

NRL scientists believe the potential of magnetic forming, and this includes its commercial applications, is just now entering a new era. They admit that applications of their swager are limited by the size of the forming heads, but say that magnetic forces dispensed by variously shaped instruments (a hand tool like a hammer, for example) or combined with die heads, could offer an infinite number of possibilities for the metalworking industry. (For other recent developments in magnetic forming, see *AM/MM*—Mar 20 '61, p117, and April 3 '61, p99.) •

Special Report No. 506 **American Machinist** / ***Metalworking Manufacturing*** *May 15, 1961*

Power-Driven Brushes

what they do — how they do it



From tiny thread deburrers to huge scale removers, the right power brush for the job can be a real time and money saver for any shop.

Three basic variables go into brush construction: the fill material, the length (or trim) of the fill, and the density of the fill. The combination of these, and the speed of rotation, determine the brush use.

Brushes do their work in three ways: Tips on wire units can cut metal; the fill produces an impact action as it whips across a metal surface; and, with abrasives, a brush can produce a fine microfinish on a part or surface.

To show what any combination of variables produces we have isolated each type of brush, discussing where each works best and why it does a good job. With this guide, you can pick the right brush for your own operation.

By E P Fisher, Osborn Manufacturing Co, Cleveland, Ohio

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Power-Driven Brushes . . .

Radial brushes: short-trim, dense wire fill

One of industry's workhorses, the radial short-trim brush develops very little impact action. But its short-trim, dense construction gives it tremendous cutting action. Fill wire can be any of several diameters (0.0118 in. is the most popular). At 6500 sfpm, this brush is extremely fast cutting.

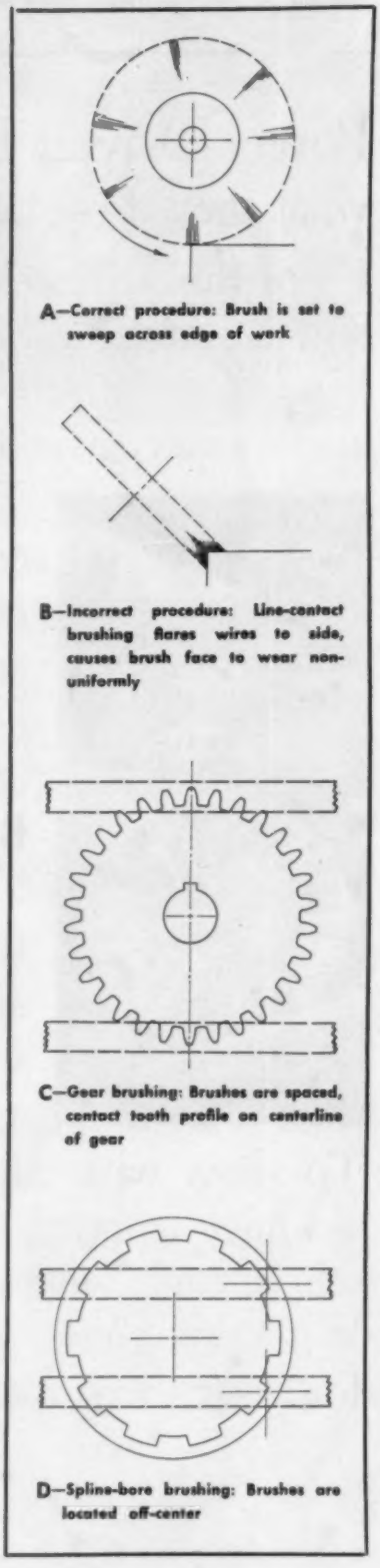
Throughout the gear industry, the short-trim brush performs a finishing operation—usually right after gear hobbing or spline broaching, but before shaving (or grinding) and heat treating. Brushing the gears here removes burrs and produces a radius on the tip of each tooth.

In subsequent machining, this radius is important: Helical gears, for instance, need a large radius on the acute-angle side; otherwise, shaving of the gear will produce a very sharp edge. Too, when brushing precedes shaving, metal does not compact at the tooth edge during shaving (and thus blister out during heat treating). The radius that brushing produces is large enough to leave a blended edge after shaving.

In gear finishing, the short-trim brush has several advantages over other tools. With the proper equipment, it will produce uniformly finished parts throughout its life. It does not leave fragmented metal or sharp edges on the part, as burring tools or fixed abrasives can (especially when they become dull or loaded). And this type of brush confines its action to the tooth edge, removing metal without changing the dimensions of machined surfaces; slurry finishing cannot do this.

During finishing, the contact that the brush makes with the part is very important. Brushes should sweep across the edge of the part (see "A" in drawing, right). Line-contact brushing ("B") should be avoided if possible, because wear on the brush face will not be uniform: in addition, the flexible wire points tend to flare to the side, minimizing the effectiveness of the brushing.

In gear brushing the brushes are spaced, contacting the tool profile on the gear's centerline ("C" in sketch). With this setup, brushes can be reversed, keeping the wire points at their maximum cutting efficiency. The setup for brushing spline bores ("D") differs from that for gears; here brushes are located off-center. To brush helical gears, it is sometimes necessary to favor the acute side of the gear, to develop a large radius prior to shaving.



A—Correct procedure: Brush is set to sweep across edge of work

B—Incorrect procedure: Line-contact brushing flares wires to side, causes brush face to wear non-uniformly

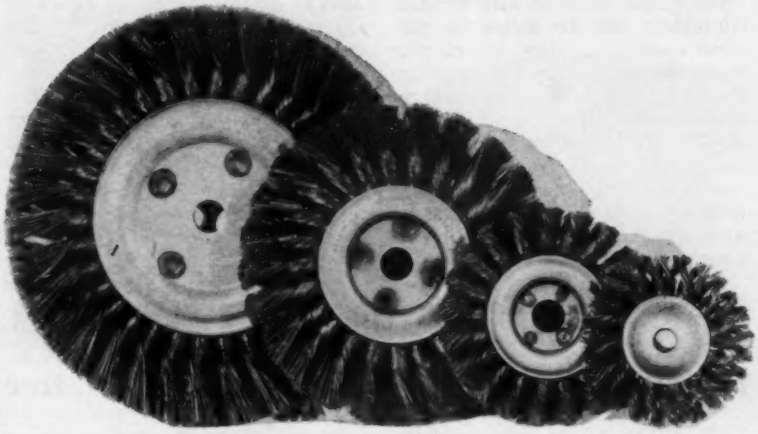
C—Gear brushing: Brushes are spaced, contact tooth profile on centerline of gear

D—Spline-bore brushing: Brushes are located off-center

POWER BRUSHING: DO'S AND DONT'S

- Brush across edges for best results.
- Use short-trim brushes for deburring and producing radii.
- Select as large a brush diameter as practical.
- Use the smallest-diameter wire fill that will do the job with normal brushing pressure.
- Do not use excessive rotational speeds.
- Do not use excessive brushing pressure; it will only cause fatigue of the fill material.
- Don't forget that brushes will remove metal from an edge or parting line.

Radial brushes: medium-to-long trim, knot-type



Normally used singly—and on portable tools—the twisted-knot brush is one of the most versatile in industry. The important thing to remember about this brush is that surface speed plays an extremely significant role, because it changes the type of brushing action so greatly. At low surface speeds the wheel is very flexible; at high speeds, this type is extremely hard and fast cutting.

The application, of course, determines the operating speed and the trim length. Medium-trim brushes (3, 4, 6, and 8-in. dia) are excellent for cleaning welds. All the autobody assembly plants use these tools (wire size normally is 0.0118-in. dia) for cleaning welds before applying lead to weld joints on the car body. Here speeds range from 6000 to 7500 sfpm.

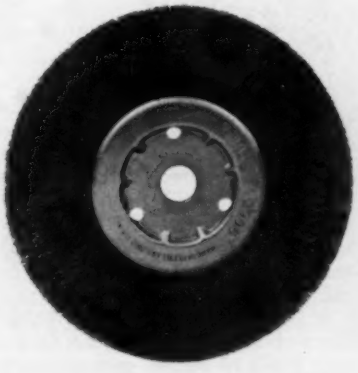
The high impact action developed by medium-length brushes of this type makes it an ideal tool for weld cleaning in other industries. In pipeline construction, most common wire size is 0.020 or 0.025 in., where in the cleaning of restricted welds this size develops a narrow face at 4500 to 6000 sfpm. In this application the brushes clean surfaces prior to painting, stripping rust, loose mill scale, and old paint from the pipe.

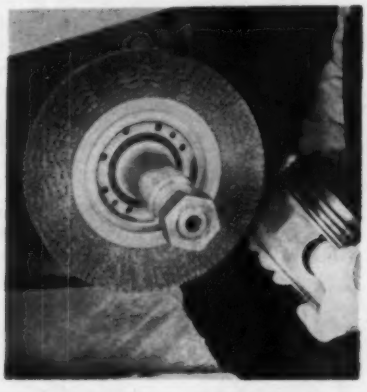
Longer-trim brushes (those with 10-to-15-in. diameters) perform quite different operations. In the rubber industry, 15-in. brushes remove rubber flash at 12,000 sfpm. At this speed, the brush knives down to an extremely narrow face, one that develops the considerable cutting action needed to strip rubber flash from molded products.

On the other hand this same brush, run at a much slower 1200 sfpm, can clean mesh-wire conveyor belts that become loaded with resins and other materials in plants which process rock-wool or fiberglass insulation. At this extremely low speed the brush is quite flexible and dislodges material from the belts easily.

Other sizes of this brush (10-and 12-in. dia) are used primarily for cleaning and finishing jobs. At speeds of 4500 to 5500 sfpm, they produce a deep satin or "orange peel" finish. They can remove paint, varnish, and loose scale at a low end-of-service cost.

Radial brushes: medium-to-long trim, crimped-wire type





Of light-to-medium density, the crimped-wire brush makes up a large percentage of industrial brushes. It was the first of the modern power-driven type; consequently, it is more widely found than any of the other types discussed here, even though it may not be the best brush for the job.

In the 4-to-8-in.-dia size, these brushes primarily serve as utility tools on bench grinders for a number of jobs: removing feather grinding burrs, machining burrs, cleaning, and producing a satin finish on a part. These tools are suitable for jobs in which the operator (rather than the machine) holds the part for brushing. Because of the cushion or softness inherent in the construction, the operator can hold and control the part easily. As a result, many operators prefer this type of brush. But brushes in the small diameters are not normally recommended for high-production machine work, be-

cause they do not have enough cutting action to be efficient tools.

The larger crimped-wire brushes (10-to15-in. dia) are suited for machine operations. They can remove feather grinding burrs to produce a uniform finish, or they can remove oxides where finish is important. The finish is primarily a "satin" or "mat" type. For most operations with these larger-size brushes, speed is 4500 to 6000 sfpm. And for most work wire size is 0.008 to 0.0118 in.

For really fine finishes a smaller-diameter wire (0.005 in.) is used with deburring compound to improve the microinch finish on parts. Enough of this compound (stick or slurry, usually grease base) is imbedded on the wheel's face to give additional cutting action that the wire in itself does not have. The compound prevents any rolling of a grinding burr or rolling an edge on a soft, ductile metal.

It is important to remember these things about crimped-wire brushes, light-to-medium density:

- The brushes have a certain softness or cushion that is desirable for brushing parts held by operators. This cushion also allows the brush to conform to irregular surfaces and hard-to-reach areas.
- Normally, the smaller-diameter brushes are not recommended for high-production operations.

Newer tools in the brush-making industry will be replacing these tools, as education and familiarity with the newer products become more general. Products like the twisted-knot brush, and radial brushes whose fill material is held together with plastics, will be the new generation of power-driven brushes.

Radial brushes: sectional, nonmetallic fill, treated and untreated

When the fill is a nonmetallic material, such as tampico or cord, the power-driven brush becomes an excellent tool for finishing parts to improve the microfinish, or to improve the surface for plating. Such a tool always does its work with a grease-base deburring or buffing compound.

Nonmetallic brushes do more than improve a part's microfinish; they can also increase its life. The following example, from the aircraft industry, is typical: In 1942 the Bendix Aviation Corp was manufacturing cams for aircraft magnetos. Surface finishing was a hand job, to 1 microinch, with crocus cloth and oil. The completed part had an operating life of 300 hours.

Switching to power brushing, the company finished the parts with treated tampico and burring compound as the parts came off a Gleason contour microgrinder with a 10-mu finish. After five seconds of brushing, the parts had a 4-mu finish. Tests showed no wear after 1000 hours of use.

More recently, jet-engine builders have found that half the failures in parts can be traced to stress concentrations and progressive fractures at scratches, sharp edges, or burrs. Continued operation of an engine causes these stresses to be repeated; microscopic cracks widen, and an entire member can rupture if the crack goes undetected. Tests have shown that a sharp corner or edge can reduce the endurance limits of a part as much as 50%. And a distinct "V" notch, such as a hard tool might make, can raise this figure to 60%.

These hard facts have brought about high standards for surface finishing of jet-engine parts. Teaming with aircraft engineers, machine-tool engineers have devised power finishing techniques, using treated tampico brushes and deburring compound, that will produce radii and improve microfinish. These brushes, run at 5500 to 6500 sfpm in machines designed for the brushes, have produced fine results.

In metal finishing, it is important to remove the sharp peaks that fixed abrasives leave on a surface, so that the surface will accept a uniform plating. Polishing marks, draw marks, and scrtches can be blended very successfully with these brushes, which usually operate at 7500 sfpm here.

This setup works well: Treated-tampico brushes are placed on the first heads of in-line or rotary finishing machines; on succeeding heads, sisal or cloth buffs then produce a high-luster finish.

Fast-cutting, but less flexible than a treated tampico wheel, the cord-filled brush produces a better microfinish and a higher luster. Treated cord works extremely well on stainless parts that have a relatively flat surface. In the buffing of stainless, this wheel should be at the first station of the finishing machine, with sisal or cloth buffs on following heads.

These things should be remembered about these brushes:

- They greatly improve the surface finish and prevent wear and fatigue of parts, because they produce such a smooth blended surface.
- They are selective to an edge, in that they will remove metal from an edge but not from adjoining surfaces.
- They will not remove metal from a flat surface but will improve the microfinish.
- They should always be used with a grease-base deburring or buffing compound.
- They will not roll an edge on ductile metal. They will produce a very uniform radius without peening or rolling any secondary metal.

Nonmetallic brushes made from **untreated** tampico and synthetics are also available. These do light cleaning operations or, wettened, scrubbing jobs. Synthetics are desirable when alkaline cleaners or solvents are being used.

Cup brushes: wire filled

Wire-filled cup brushes are extremely fast-cutting wheels, which on portable tools clean welds, scale, rust, and other oxides. These tools operate at speeds of 8,000 to 10,000 sfpm. For most jobs, wire size is 0.020 in.

Shipyards and the structural-steel industries make the greatest use of these wheels. In addition, the pipeline construction industry uses them, at the site of pipe installation, to clean the pipes' OD before coating. Finishing machines here have a number of cup brushes located on a rotating fixture that revolves about the pipe OD.

The cup brush has three distinct advantages over other ways to do this kind of cleaning:

- The newest of these brushes are fast acting and clean large areas quite rapidly.
- The portable tools and source of power are economical, compared to other cleaning methods.
- Setup time is a minimum, because the brush can be put into operation quickly, compared to sand or shot blasting.

Beside the above work, cup brushes are excellent tools for deburring (at 4500 to 6500 sfpm) and producing a radius around the periphery of holes, as on tube sheets for heat exchangers. On the edge of a hole, the cup brush produces a uniform radius without elongating the hole area (see photo).

Still another use: Cup brushes can remove burrs and produce a radius on the edge of internal gear teeth. Here the brush operates on what is called a mid-cycle reverse: four seconds in a clockwise direction then four seconds counterclockwise. This produces a uniform blending of the edges.

Cup brushes are preferable to radial brushes for this work on internal gear teeth, because the radial type cannot contact the work area nearly so well. Too, because of the angle of approach, the radial brush is restricted to an extremely small diameter. And in high-production work, it is best to use as large a brush as possible, to minimize the downtime for replacing brushes. With its relatively long life the cup brush fits these requirements nicely.

Centerless brushes

Centerless-grinder brushes fit standard centerless grinders such as the Cincinnati No. 2 and 3 and the Landis No. 5. These large radial brushes have a wire fill (0.005 through 0.010-in. dia) or a fill of treated tampico or cord.

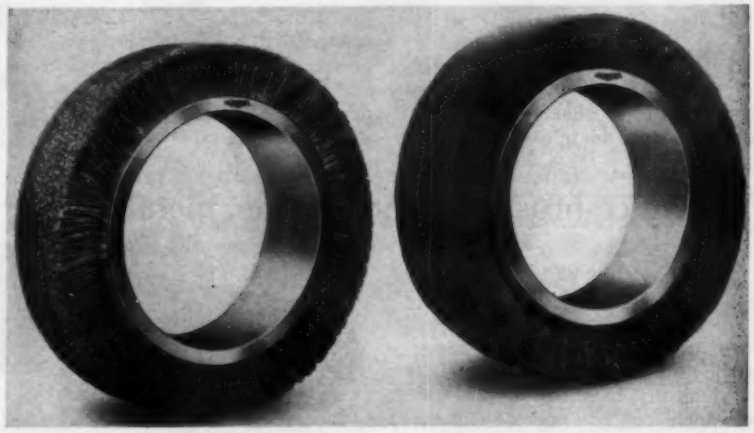
When the fill is wire, these tools remove grinding burrs and produce a minimum edge of 0.005 in. Finishing work can either be dry or(preferably) with normal grinding coolant.

These brushes have opened up new applications for brushing tools. Fine-wire-fill brushes, working with conventional grinding coolant, are removing feather grinding burrs and improving surface finish on such parts as control valves for automatic transmissions. Here they can improve the finish from 7 to 4 mu.

If the fill is treated tampico or cord, applying a grease-base polishing compound to the wheel face will give finishes in the range of two through seven microinches.

It is important to remember these facts about centerless brushes:

- They will not remove metal from a cylindrical surface. Parts must therefore be ground to size before brushing.
- Greatest improvement in finish is in the (for unbrushed parts) 25-to-30-mu range. A part with a 25-mu finish can be brushed rapidly, improving surface finish to 10-to-15-mu. A part with a 10-mu finish will have a 4-to-6-mu finish after brushing.
- Centerless brushing follows centerless grinding principles, with the following additions: (1) Accuracy in pressure and adjustment is not critical with brushes; thus a machine no longer acceptable for grinding can do brushing. (2) If more brush pressure is needed to obtain the required finish, it is possible to locate the part below the brush centerline.



Wide-face brushes: custom-made, nonmetallic fill

These specially made brushes perform cleaning jobs throughout industry. Filled with natural fibers, mixtures, or synthetics, they usually operate in the 750-to-1000-rpm range.

In most cleaning work, these brushes combine with cold-water rinses or heated alkaline solutions to do the job. Typical applications in the steel industry: on electrolytic tinplate lines, continuous cold-reduction lines, continuous galvanizing lines, and silicon-steel cleaning lines. For most of this work the brush diameter in 12 in.

The following techniques apply here: (1) The brushes rotate opposite to travel of the steel strip. (2) A backup roll is located opposite the brush. If possible, the strip should break over the backup roll. (3) The spray of rinse water should be directed at the bite, that is, where the brush and strip make contact.

In addition, a brush mounting is recommended, one that permits water to circulate out through the brush face. In this setup, a rotating coupling attaches to a stub shaft that, like the brush mounting, has holes drilled in it. Normal water pressure of 20 lb is adequate to flow through the mounting and out through the brush face. This construction not only washes the brush filaments, but also dissipates heat that develops at the base of the brush.

This construction is even more important when synthetic fill replaces natural fibers. Because the synthetic fiber doesn't wear so rapidly as the natural, it has a greater chance to pick up dirt. Circulating water through the brush face minimizes dirt loading.

These wide-faced nonmetallic brushes are also popular (outside the steel industry) in the material-preparation departments of stamping plants in the automotive and appliance industries. Here, in such machines as McKay roller-levelers, they remove dirt and oil from metal surfaces before the steel is leveled.

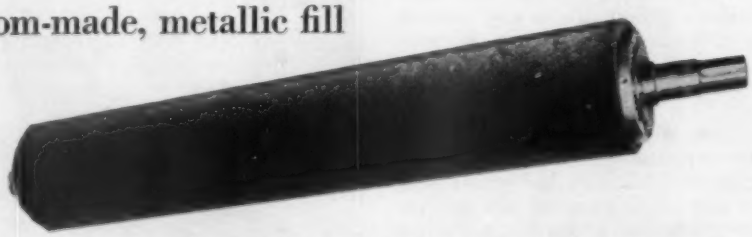
Besides doing wet-cleaning jobs, these brushes are effective tools for dry-finishing work. In the paper industry, for instance, they can produce a high-luster finish on paperboard products.

Nonmetallic wide-face brushes also are used with slurries, such as pumice and water, to produce a dull or mat-type finish on materials like stainless and synthetics (formica, for example). The brushes rotate at about 600 rpm, and the slurry is pumped onto the sheet surface before the sheet enters the brushing stations.

These factors about wide-face nonmetallic brushes should be kept in mind:

- On wet-cleaning jobs there should be enough rinse water to assure maximum cleaning action. If possible, water should circulate through the brush mounting.
- On most applications, surface speeds of the brushes should be in the range of 2000 to 3600 sfpm. Speeds above this will not appreciably improve the operation; and brush wear will be excessive.
- Because the fiber tips do the work, it's important to avoid excessive pressures. Ammeters should be installed in the drive-motor circuit, to indicate brushing pressure.

Wide-face brushes: custom-made, metallic fill



Wide-face brushes with metallic fill, made to each customer's specifications, perform a number of operations in the aluminum, steel, copper, and brass industries. These are dynamically balanced at the speed at which they will operate (for most jobs, 2000 to 4000 sfpm).

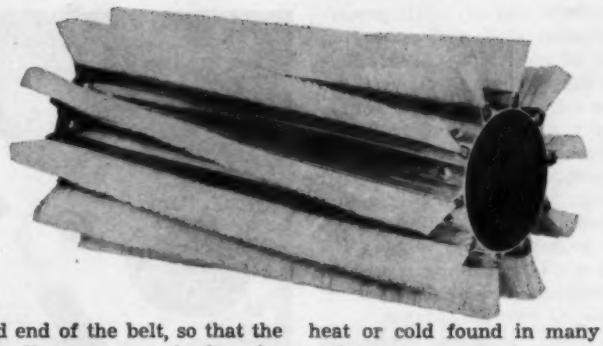
In aluminum mills, these brushes remove the build-up of aluminum oxide from the work rolls in the hot mill. To do this, they run at speeds of 600 to 1200 rpm, depending on the mill's line speed. Cleaning here is continuous, to keep aluminum oxide from being rolled into the strip being produced. In this work a soluble-oil mill solution helps the brush. Pressures of about six pounds per linear inch of brush face make the cleaning satisfactory and give maximum brush life.

In the steel industry, these custom-made wire-filled brushes remove lime or magnesium coatings from certain types of steel. Normally, scrubbing is with water; the operation is somewhat similar to scrubbing steel with nonmetallic-fill brushes. Another use for this type of brush is developing in the steel industry: removing carbon smut from steel after Wheelabrator and pickling operations.

For this type of brush, these things should be remembered:

- Each brush roll should have its own drive. In the drive-motor circuit, an ammeter should be present to measure brushing pressure.
- If strip is being brushed, a steel backup roll should be opposite the brush roll.

Wide-face brushes: strip type



Radial wide-faced brushes, made in strips (which give an interrupted brush face) perform cleaning operations that would cause a solid-face brush to become loaded, thus unusable. These brushes find their greatest application in conveyor-belt cleaning.

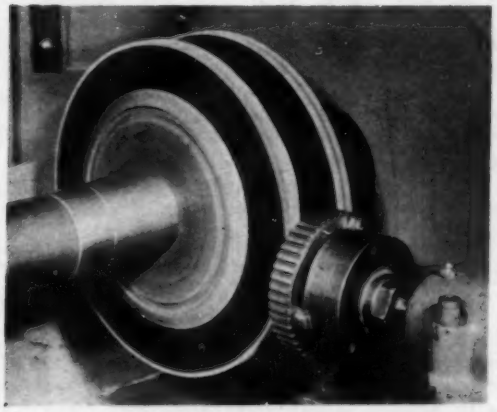
When material is conveyed on rubber and fabric belts, some of it adheres to the belt after the belt drops its load. Called carryback, this material tends to load the snubber pulley and return idlers. Maintenance cleaning is not cheap.

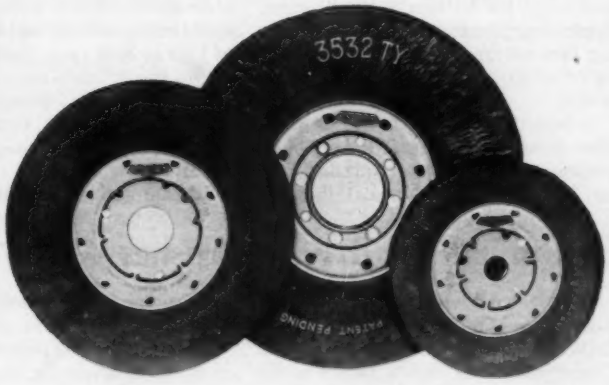
Strip brushes can remove this carryback very successfully. Operated at a surface speed two to three times that of the belt, they rotate in a direction opposite to the belt's. The brush should be positioned at the head end of the belt, so that the header pulley acts as a backup for the belt. Locating the brush here also usually throws the carryback into the same hopper that receives material from the belt. Fill material for these strip brushes is a special synthetic that can withstand the heat or cold found in many applications.

These things should be remembered about wide-face strip brushes.

- They are designed for medium-to-light-duty work.
- Their main advantage is that the brush face does not load.

Radial brushes: wire-filled, elastomer-bonded





There are two types of plastic-bonded, wire-filled brushes. One contains an elastomer that allows the brush to retain characteristics similar to that of a dense wire-filled brush: The filaments can move, giving the brush a cushioning effect. A second, more recent development gives a more rigid brush, one that must be used with very precise adjustments.

Latest developments in the brush industry, these tools can do several types of work that formerly were considered impossible for brushes.

The first group of these brushes, which retain the conventional cushioning effect, have replaced other brushes in many jobs; in the electrical industry, they have even expanded the use of brushes. Here are some typical applications:

- Removing insulation from copper leads in the electrical industry is a typical job. Periodic dressing of the brush face will give advantage and brush life in the range of 10 to 1 over conventional stripping wheels. Surface speeds for this work range from 4000 to 6000 sfpm; fill material varies from 0.0025 to 0.008-in. dia.
- Removing burrs from tubing and stampings. Surface speeds: 5000 to 7000 sfpm. Wire size: 0.0118 normally.
- Removing burrs from key slots and other hard-to-reach areas. This brush is an effective tool where it is important for the brush to maintain a uniform face throughout its life.

The latest development in bonded wire-filled brushes is a relatively hard-faced wheel made by the Osborn Mfg Co. This wheel cuts very rapidly; thus adjustments of the brush and the work must be precise. Unlike conventional brushes, it will remove burrs and produce radii without producing a secondary rolled condition. It is very effective on powdered metal, aluminum diecast parts, and fine-pitch gears.

At maximum efficiency, speeds of this brush range from 2600 to 6000 sfpm. Because this type has such a fast cutting action, surface speed can be lower than ordinary.

Two things should be remembered about these new brushes:

- Because cutting action is so fast, brush adjustment is important, and the part must be held precisely if the brush is to be used efficiently.
- Brush life is much longer than with conventional brushes; as a result, end-of-service cost for a given operation is much lower.

Power-Driven Brushes . . .

Small-diameter brushes

A complete line of small power-driven brushes, some with a working diameter of only 5/32 in., is available. As the photograph shows, these tools use rotary, end, or side action.

Basically, the operating rules for larger-diameter brushes apply to these tools. Here are some typical operations: deburring intersecting holes, cleaning internal threads, removing heat-treat and weld scale, cleaning molds, removing insulation from electrical wire. Each type of brush has its own advantages.

Small radial brushes, similar to the larger ones discussed earlier, can be as tiny as 1 in. in diameter; they are most effective in diameters of 1-½ through 3 in. Fill material can be wire or nonmetallic. Wire sizes range from 0.0025 to 0.104 in.; most jobs use 0.005 to 0.0118-in.-dia wire. Surface speeds are 2500 to 5000 sfpm.

End brushes, circular end brushes, and Sibot-type brushes clean the walls of cavities without marking or scoring the bottom of the cavities. Typical applications include removing carbon from cylinders, cleaning valve seats, and polishing dies and molds.

Side-action brushes remove burrs from threads on internal holes. These brushes (as small as 5/32-in. dia) can be mounted in special fixtures for cleaning the OD of copper and aluminum tubing before soldering. Rotational speeds are in the range of 1750 to 3400 rpm. Reusable holders retain the brushes securely and keep the stems from being bent. With these holders, the brushes can be reversed without damaging the stem or fill material.

It is important to remember two things about these small brushes:

- They are designed for work in restricted areas, where large brushes cannot contact the area to be brushed. The largest brush practical is the one that should do a given job.
- For tools 3 in. or smaller in diameter, rotational speeds above 6000 rpm do not appreciably increase the cutting or finishing action.

Equipment for driving brushes

If power-driven brushes are to do high-production work, they must be driven by the proper machines. These machines must have ample horsepower, proper-size shafts, and good bearings. Of great importance, too, is flexibility of design, so that machining or part design changes (which may change the burring or finishing problem) will not make the machine obsolete.

The horsepower requirement for a deburring operation with a 14-in.-dia wheel is quite different from that for a job requiring brush-and-water cleaning of strip metal. Because power consumption does differ so greatly, and because there is no basic information available to designers, special equipment usually is not adequate for the job. As a result, standard equipment has had to be designed and built.

These standard machines, capable of high production, are very flexible. Motors are powerful enough to give ample horsepower; ammeters in the drive-motor circuit measure brushing pressure; reversing switches change the direction of brush rotation, so that wire points are kept at maximum efficiency; part dwell time can be adjusted for specific jobs. And on these machines automatic feed, to compensate for brush wear, is available.

These standard units vary from manual-load types to automated equipment, but in all cases the machine has been designed for the brushing tool selected for the job. Because of this approach, gear finishing no longer is considered a secondary operation; today it is integrated in lines, following hobbing and preceding shaving.

What is the best machine for a given job? The answer to this question depends, of course, on the application, which should be analyzed in the following manner:

- Determine job requirements: (1) What is to be done: deburring, producing radii, etc? (2) What is the production rate? (3) How many surfaces must the brush contact? (4) Must the equipment be integrated in a line, or run separately?
- Select the type of brush that will best do the job.
- Determine horsepower requirements for the job.
- Select standard equipment, whenever possible, which will best accommodate all of the above factors. •

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1961 TOOL SHOW

Your Guide to the Exposition

This special section for the 1961 Tool Show contains a list of exhibitors (below), floor plan of the New York Coliseum (other side of this foldout), a resume of the Productivity Program, and a preview of new products being introduced at the Tool Show

List of Exhibitors

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AA Gage Co	2518
Aaron Machinery Co	1615
Accurate Bushing Co	2254
ACF Electronics Div	1623
Advance Products Corp	3302
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Aget Mfg Co	3922
Airetool Mfg Co	1441
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Allegheny Ludlum Steel Corp	2233
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American Drill Bushing Co	2022
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American Machinist/ Metalworking Mfg	2033
American Metal Market	3927
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American Twist Drill	1315
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Moog Servocontrols Inc	1430
Muskegon Tool Ind	1122
N	
Nelco Tool Co	1315
New Hermes Engr Machine Corp	3311
Niemi Mfg Co Inc	1541
Nikon Inc	2150
Nissho Amer Corp	3312
Noble & Westbrook	3130
No Amer-Viking Drill	1710
Northwestern Tools	3852
O	
Oakite Products Inc	3602
Oberg Mfg Co	2146
Opto Metric Tools	2201
Kurt Orban Co Inc	2011
Osborn Mfg Co	2407
A Ottavino Co	2611
P	
Parker-Kalon Co	3411
Pedrick Machine Co	1729
Perkins Machine Co	1229
Permattach Diamond Tool Corp	2107
P I C Design Corp	3505
Pines Engrg Co	2019

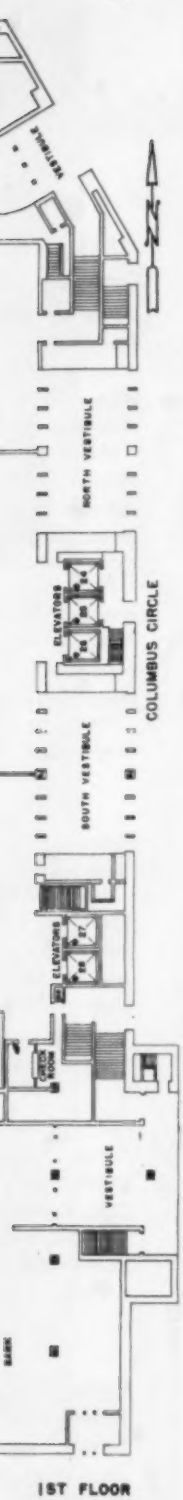
Company	Booth No.
Portage Double Quick Co Inc	2622
Porter Precision Prods	3605
Pratt & Whitney Co	2529
Precision Carbide Corp	3913
Precision Detroit	3246
Precision Welder Flexopress Corp	2454
Procunier Safety Chuck Co	1409
Producto Machine Co	2450
Progressive Welder & Mach Co	3825
Punch Products Corp	1532
Q	
Quality Control Corp	
R	
R O Mfg Co	1025
R B Tool Co	2640
Ray Data Corp	1335
REM Sals Div, R E Morris Co	1128
Ren Plastics Inc	3606
Rheem Mfg Co Electronics Div	3510
J A Richards Co	1631
Wm L Riggs Co	1345
Rowe Machinery & Mfg Co Inc	2307
Rudel Machinery Co	2421
S	
S & S Machinery Co	2446
Sandvik Steel Inc	1041
Sanford Mfg Corp	3829
Scherr-Tumico Co	2138
A Schraders Son Div Scovill Mfg Co Inc	1521
Scully Jones & Co	2521
Edw Segal Machinery	3229
Seibert & Sons	1001
The Sentry Co	1724
Service Machine Co	3232

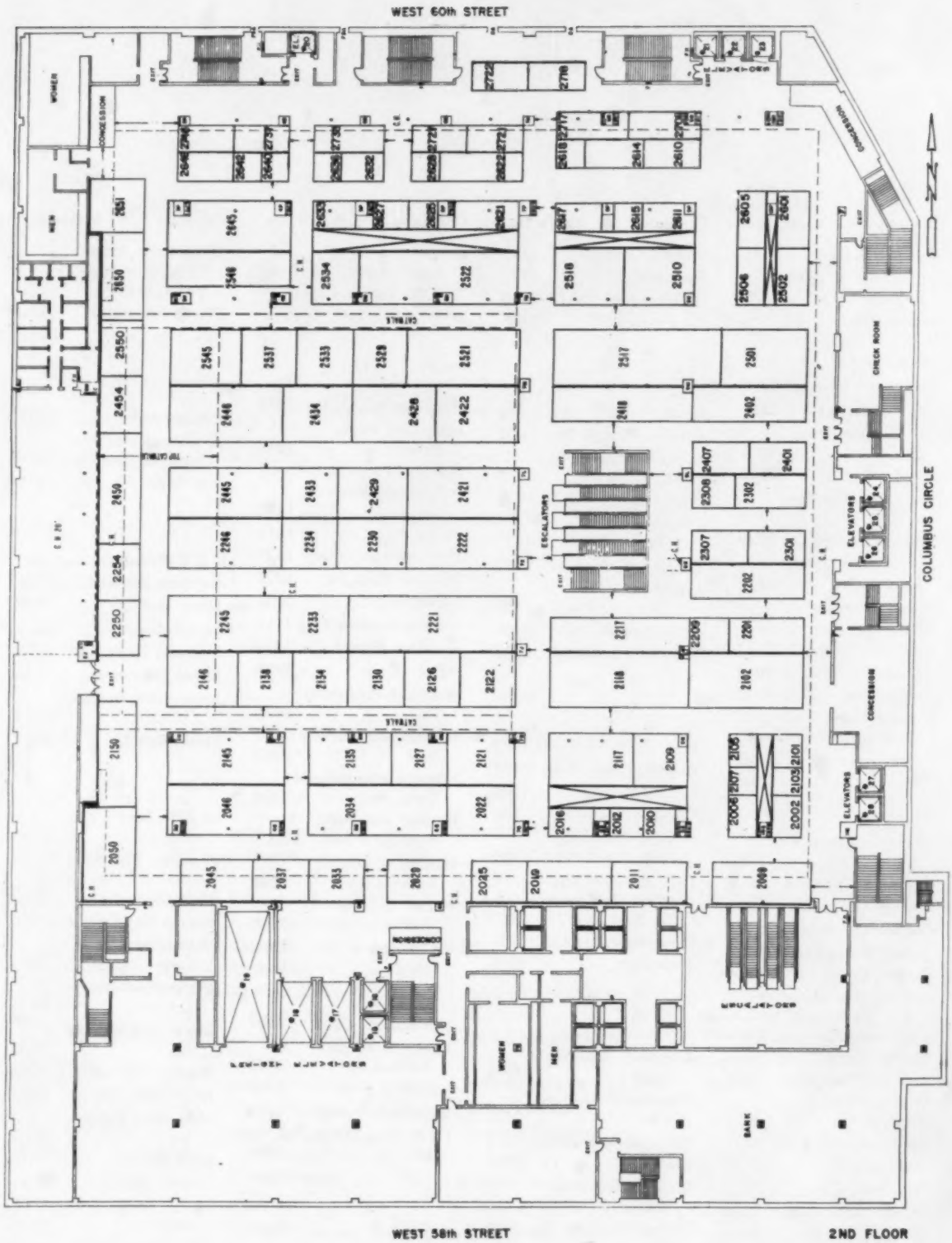
Company	Booth No.
The Sheffield Corp	1414
Sheldon Mach Co Inc	1250
Siewek Tool Co	2308
Sigma Machinery Inc	2230
Sifco Metachemical	3912
Simonds Abrasive Co, Simonds Saw & Stl	3818
Simplicity Engrg Co	3110
Simpson Optical Mfg	1104
Sintercast Div of Chromalloy Corp	3901
Skilcraft Corp	3239
South Bend Lathe	1138
Spitfire Tool & Mach	1529
Standard Pressed Steel Co	2302
Standard Tool & Mfg Co	1341
Stanley Electric Tools, Div of Stanley Wks	3830
Starlite Industries	1725
L S Starrett Co	1214
Steco Corp	3417
Stewart-Warner Corp	3917
Sunnen Products Co	1515
Sun Oil Co	3306
Superior Die Set Co	3618
Supreme Products Corp	1125
Swanson Erie Corp	2534
Sylvania Light Products	3921
T	
Taper Micrometer Co	3230
Templet Industries Inc	3517
Texaco Inc	3146
Thompson Ramo Wool-dridge, Gage Div	1536
Tool & Mfg Engineer	2522
Torit Mfg Co	3810
Torrington Co	2105
Traub Inc	3317
Triplex Machine Tool	1604

Company	Booth No.
U	
Field Office Service U S Dept of Commerce	2034
U S Tool Co	2250
Uddeholm Co of America	2121
Ultramatic Equipment Co	3509
Ultrasonic Prec Co	2234
United Associates Advertising Assoc	3235
United States Leasing Corp	3412
Upton Bradeen & James Ltd	3601
V	
VDF Lathe Div Rudel Mach	2246
Van Keuren Co	3218
Vernon Devices Inc	3120
Vidmar Inc	2545
Visual Inspection Products Co	3236
Vlier Engrg Co	2122
Vulcan Tool Co	1550
W	
Wadell Equip Co Inc	1040
Wales Strippit Inc	1305
O S Walker Co	2418
Watts Regulator Co	2006
Wespo Div, Vlier Engrg Co	2122
Waukesha Cutting Tools Inc	3914
Wesco Tool Inc	1141
Wheelabrator Corp	1502
S B Whistler & Sons	2550
Thomas C Wilson Co	1218
Wilton Tool Mfg	3838
Winslow Prod Engrg	1240
Wintriss Inc	1235
Z	
The Zero-Max Co	2025

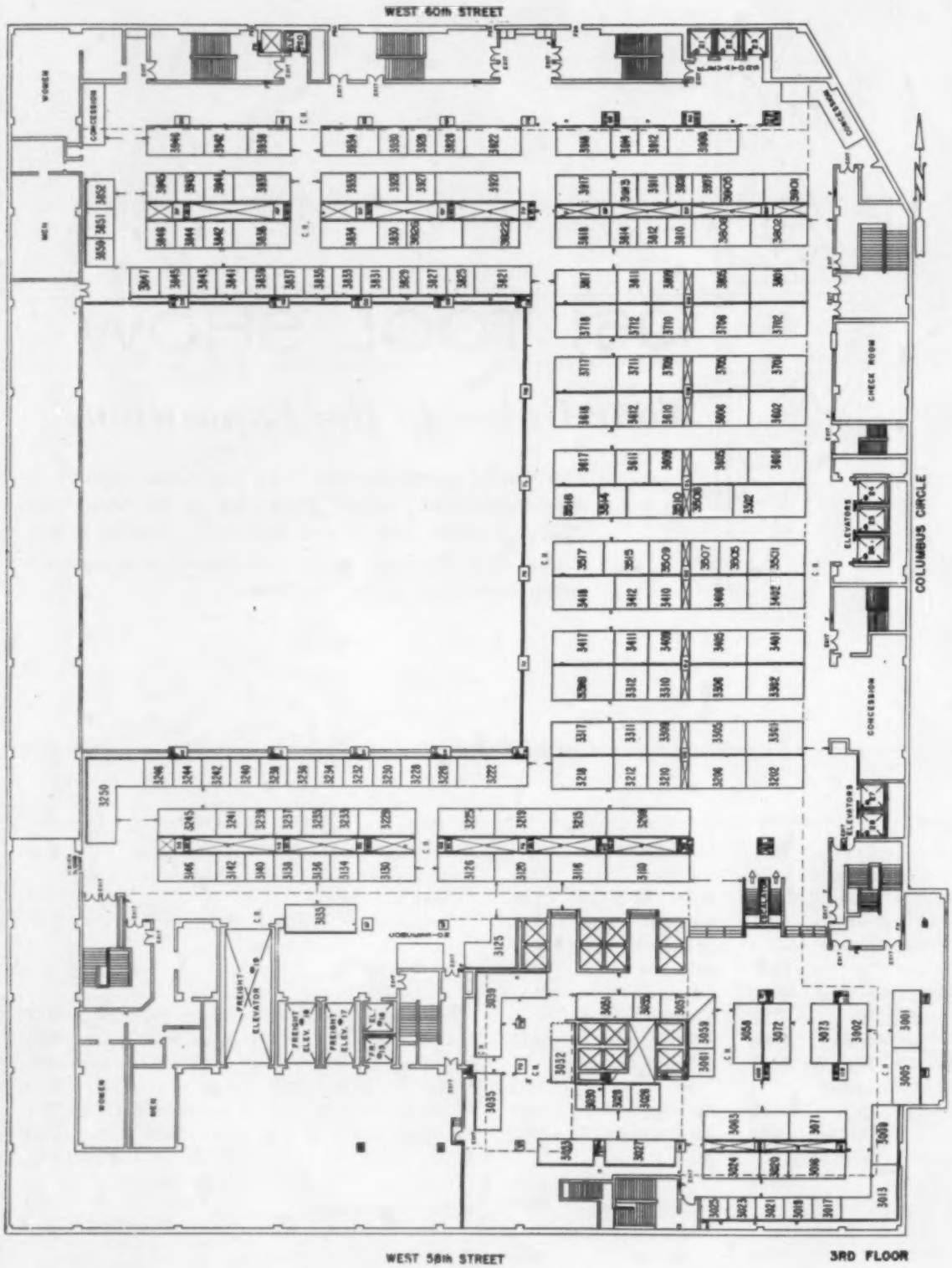
1961 TOOL SHOW

1961 TOOL SHO

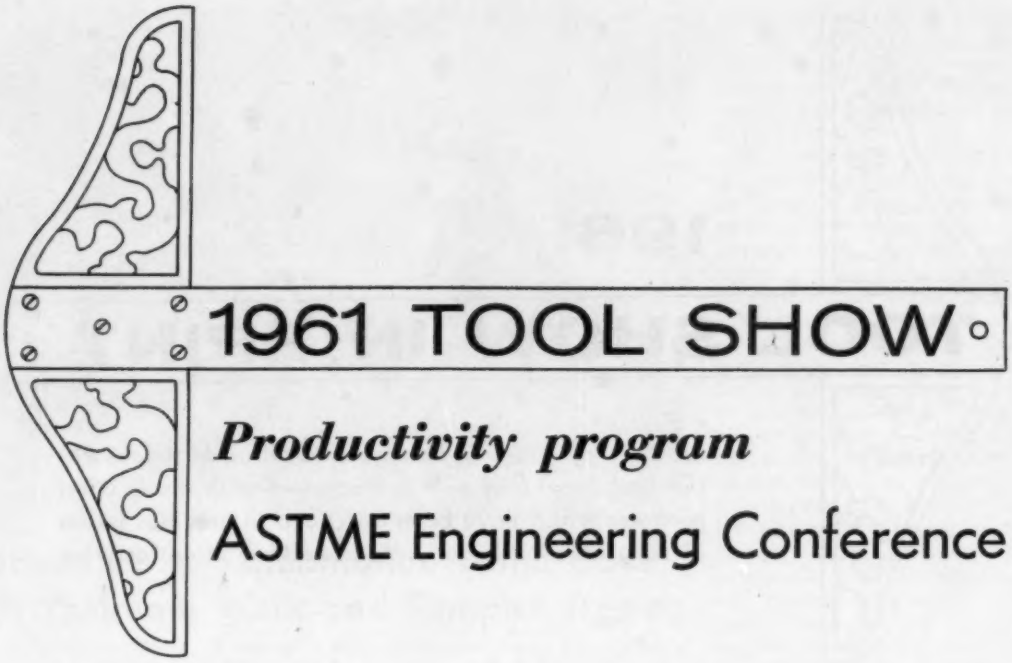




SHOW *New York Coliseum,* **May 22 to 26, 1961**



Mon	1 pm to 9 pm	Thurs	9 am to 6 pm
Tues	1 pm to 9 pm	Fri	9 am to 6 pm
Wed	9 am to 6 pm		



Running concurrently with the ASTME's Tool Show will be a week-long Engineering Conference featuring a seminar, a symposium, technical and panel sessions, and a variety of plant tours in the New York area.

The opening technical session on Monday May 22 is devoted to recent tool and manufacturing developments. It begins at 9:30 am and, like all the rest of the technical sessions, will be held at the Statler Hilton Hotel. That afternoon's session deals with operations research.

Monday also marks the beginning of a two-day Surface Metrology Seminar. This consists of presentations of technical papers, discussion periods, a problem clinic, and an open forum. Advance registration is required for this seminar.

Rounding out the first day's program are the Eli Whitney Luncheon (speaker: Wallace E Brainard, chief engineer, Servo Machine Tool Division, Kearney & Trecker Corp), and a tour of the Brooklyn Navy Yard.

Numerical control "Techtour"

Tuesday's program includes three technical sessions, a choice of three plant tours, the conclusion of the Surface Metrology Seminar, and the first of three scheduled "Techtours."

Technical sessions on Tuesday will cover press tooling progress, grinding developments, and automation and numerical control. The plant tours include trips to Electrolux Corp, Ford Motor Co's Mahwah (NJ) assembly plant, and the heat-treating plant of Fred Heinzelman & Sons, Inc.

The Techtour (engineering discussions followed by practical demonstrations on the same subject) will be an all-day affair at Republic Aviation Corp. The subject: Manufacturing with Numerical Control Systems.

Wednesday's schedule includes technical sessions on powder metallurgy and on numerically controlled machining. Plant tours are set up for Pitney-Bowes, Inc, and American Machine & Foundry Co. Another highlight on Wednesday is the symposium on Material Removal Progress, a one-day session covering advanced metal-cutting processes and tooling. Bring your problems to the symposium; much of the time will be spent in discussing questions submitted from the floor.

High-energy-rate processes

High-energy-rate metalworking will be the subject of Wednesday's Techtour, an all-day session to be held at Grumman Aircraft Engineering Corp. Following presentation of several papers on the use of explosives in metalworking operations, there will be a tour of the Grumman plant, highlight of which is a demonstration of explosive forming.

Closing out the day on Wednesday is the ASTME Annual Banquet, after which the new officers will be installed.

A full slate of technical sessions is on tap for Thursday. Topics to be covered include workholding developments, appraising the manufacturing system, cutting tool materials, and material removal. Also scheduled are three more plant trips—Lycoming Division of Avco Corp, the Poughkeepsie (NY) plant of IBM, and Adamas Carbide Corp.

The third and final Techtour, Manufacturing Operations Management, will be an all-day affair combining engineering papers and discussions on operations management with a tour of the IBM plant.

The program for Friday is limited to two technical sessions—tracer and numerical control systems, and tool engineering progress. The final scheduled activity is the Honor Awards Dinner on Saturday at 7:30 that evening.

As during previous ASTME Conventions, there will be a full calendar of ladies' activities—a get-acquainted party, a tour of the United Nations, a tour of New York City, a boat-trip around Manhattan Island, plus other special events.

And don't forget—the Tool Exposition is open every day at the Coliseum. Now turn the page for a preview of what you'll be seeing. •

1961 TOOL SHOW IN PRINT

Products described in this section will be introduced at the Tool Show and will be displayed with many other products which have been described in previous issues of American Machinist / Metalworking Manufacturing

Rheem 'Building Block' N/C System Can Be Switched From 1 Machine to Another

Housed in a cabinet 4½ ft high and slightly over 3 ft wide, the M23 numerical positioning control can automate several machines in the same shop and can be modified to control an unlimited number of axes on one or a series of machines.

The M23 is designed on the building block principle so that new axis controls are added as completely packaged modules that slide into the main cabinet. Axes can be controlled simultaneously as in contouring, or in a specified sequence as on a turret drilling machine.

Position display clearly shows feedback from one, two or more axes of machine motion. Information for the display is picked up by a position transducer geared to a leadscrew or a precision rack. It also gives a signal for machine zero

Three modes of operation are possible with the M23: manual, in which the operator controls the axes through dial inputs and jog controls; semi-automatic, for one tape operation at a time under operator control; automatic, in which three axes, including tool feed cycling, are controlled from the tape.

Input data is punched on 8-channel tape with a Rheem preparation keyboard and a standard Friden punch, or if EIA binary-coded decimal system is needed for an operation, a code converter is available that will accept taped commands prepared on a Flexowriter.

This tape is read by the machine's photocell at 100 lines per sec, a speed that is said to enable the machine to read the average operation for two-axis control in 0.15 sec.

Stepping switches are eliminated on this machine by having the taped commands fed into the axis summing registers and thence to the output controls by electronic switching. These outputs can control electric drive motors, hydraulic servo motors or pistons, which drive the axes simultaneously in the commanded direction at rapid-traverse speed until near the desired stopping places. At this point, the machine will slow to creep speed for accurate repeatable positioning.

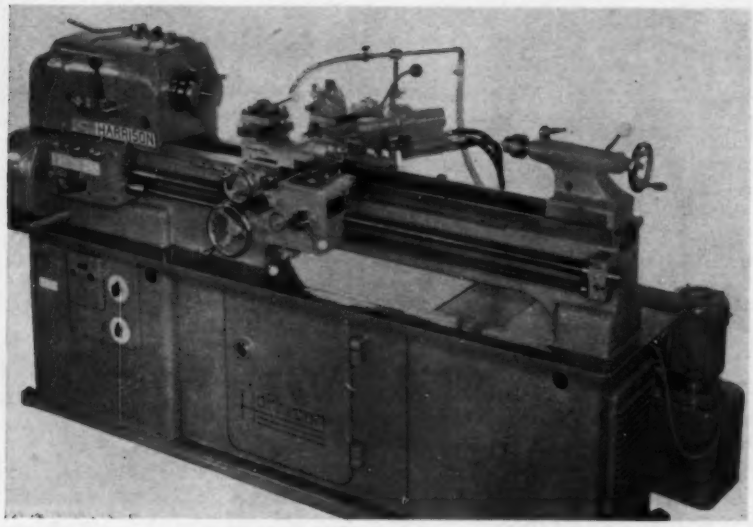
Two accuracies are possible with the M23, depending on load, positioning speed, and resolution. Positioning speeds of 120 ipm and below produce a resolution of 0.0001 in. and a control accuracy of 0.0001 in. Higher positioning speeds and heavy loads give a control accuracy of 0.0005 in. and a resolution of 0.001 in. This resolution can be increased to some extent by programming for two slow-down points.

While the axes are being driven, shafts to digital converters, or transducers, record feedback on the Rheem position display (see photo). This transducer, geared to a lead screw or to a precision measuring rack with pinion, senses the rotation of its shaft with two magnetic heads that pick up impedance changes.

When all axes are in position, an In Position lamp switches on and an electrical signal is made available for tool feed cycling, where necessary. The control will read the next operation from the tape upon receipt of a "tool cycle finished" signal for automatic cycling machines, after a button is pushed for operator tool-feed machines, and automatically for machines in which all axes are under control.

Rheem Electronics, 5200 W 104th St, Los Angeles 45, Calif

MORE DATA? Circle 121, inside back cover



Harrison 12-in. Combination Lathe Does Both Toolroom Work and Templet Tracing

This 12-in. lathe—which is manufactured by T S Harrison & Sons, Ltd, of Heckmondwike, Eng — is available in two models, with either 24 or 40 in. between centers. As shown, an optional tracing unit is built into the rear of the machine so that normal lathe operation is completely unrestricted at all times. Thus, it is possible to turn the required templet, and then lock in the copying unit for immediate quantity reproduction of the part.

Either model of the lathe delivers a wide range of turning speeds up to 2000 rpm. Because the end-train gearing is totally enclosed and operates in an oil bath, gear life is prolonged, noise level is lowered.

The lathe features anti-friction spindles with American Standard Taper-Key noses, hardened headstock gearing honed by American Red Ring gear finishing equipment, induction hardened bedways, heavy-duty motor drives with clutch and brake provision, fail-safe electrical controls, and integral heavy gage cabinet bases.

Dist by REM Sales, Inc, The Robert E Morris Co, Box 41, West Hartford, Conn

MORE DATA? Circle 122, inside back cover

GE Carbon Electrode for EDM Triples Effects From Brass

Gentrode 10 (*AM/MM*—May 1 '61, p2), a new carbon electrode material for use in electrical discharge machining, removes steel three times faster than brass electrodes and provides the same smooth finish. Therefore, it makes possible shorter electrodes and less changing of electrodes to obtain sharp finish detail.

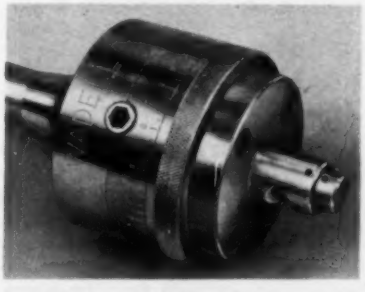
In addition, the company reports that the new carbon electrode lasts three times longer than conventional brass and keeps its original shape better than any other material tested.

Supplied in slab form rather than rods, Gentrode 10 can be machined easier than leaded brass and is said to be free of the flaking and chipping problem that has plagued graphite materials here-to-fore.

A standard-sized slab of the material measures 1½ x 5 x 11½ in. and is priced at $72, FOB.

General Electric Co, Schenectady 5, NY

MORE DATA? Circle 123, inside back cover



Quick-Change Tooling System Claims Accuracy to Millionths

Designed and developed after extensive research, the Micro-Magic tooling system is intended for use on precision boring machines, jig borers, and any other machine where quick changing of tools for high precision, multiple operations is desirable or necessary. The manufacturer guarantees repetitive accuracy in millionths.

An additional feature of this tool is that it combines quick changing and positive fine adjustment in one single tool. For example, if one had to rough bore, finish bore, and counterbore, tooling requirements would be one unit and two top plates.

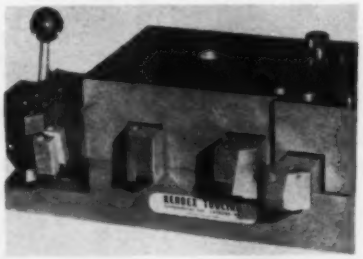
The machining procedure for above would be as follows: Complete unit (containing a top plate with boring bar for roughing) is mounted on spindle nose. After boring bar is adjusted to desired cutting diameter, dial reading on tool periphery is recorded. Then, after roughing operation, the top plate is removed and a second one (with boring bar for finishing) is mounted on unit. This bar is adjusted for finish diameter and dial reading is recorded. This top plate is removed and another containing counterboring tool is mounted and reading is recorded.

Thereafter, these three top plates can be removed and reinstalled repetitively to within a few millionths of original setting. Therefore, after first part is finished, repetitive parts can be identically finished.

The tools can be furnished in any size and style for every spindle application, as well as in complete tooling systems. Inquiries should specify all necessary spindle nose dimensions.

Wadell Equipment Co, Inc, Clark, NJ

MORE DATA? Circle 124, inside back cover



TAILORED TOOLING DISPLAY will include a variety of special boring heads, milling cutters, cat heads, and other multi-point tools (like above example). Also being shown is the B-7000 series of solid carbide shank boring bars made in ⅜, ½, ⅝, ¾, and 1-in. dia with non-adjustable heads. They are for use where ratio of length-to-diameter exceeds practical limits for steel bars—*Kennametal Inc, Latrobe, Pa*

MORE DATA? Circle 125, inside back cover

1961
TOOL SHOW IN PRINT

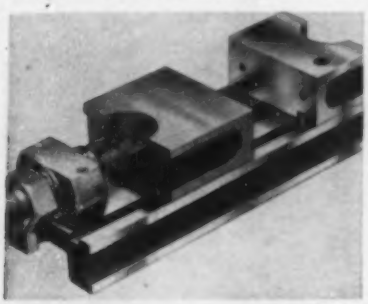
Northwestern Tools To Show Washers, Ball Knobs, Plungers

Three new items being introduced by the company at the Show are:

- Swing C washers—Made of low carbon steel, carburized, hardened, ground, and rust-proofed, these items are used as a latch in the construction of jigs, fixtures, and special machinery. They are generally used for end locations, and can be swung out of the way so that the part may be inserted and removed quickly.
- Plastic ball knobs—These items, furnished with tapped brass inserts, are for use on machine tools, mechanical units, jigs, fixtures, and other tooling. They come with a black buff and polish finish.
- Spring plungers — Often called spring loaded pins, these are said to give sure and positive spring tension. The black pentrate nose and cadmium plate nose are case hardened for maximum wear; two types of plastic noses can be used where it is important not to mar metals such as aluminum or brass.

Northwestern Tools, Inc, 117 Hollier Ave, Dayton 3, Ohio

MORE DATA? Circle 126, inside back cover



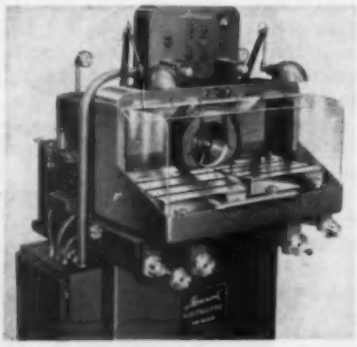
Producto Vise Turns On Side For Grinding Two Square Planes

Precision grinding vise enables operator to grind square in two planes without removing the work from the vise, by turning the vise on its side. Clamping flange on both sides is full length, and the movable jaw is adjustable for wear.

The vise is 14½ in. long, 3 in. high, 3½ in. wide and weighs 19 lb. Price of the vise, which is specially recommended for formed wheel grinding of small parts and electrical discharge machining, is $98.00.

Toolroom Equipment Div, The Producto Machine Co, 990 Housatonic Ave, Bridgeport, Conn

MORE DATA? Circle 127, inside back cover



Hammond Electrolytic Grinders Built for Tough Machining

Steel and superalloy parts, as well as carbide tools, can be ground on two new additions (Models EGD-12 and 14) to the Hammond line of oscillating electrolytic grinders. The new models, which carry 12-in. and 14-in. wheels, are built for pushbutton, high-production grinding that maker claims is burrless and free from metallurgical damage.

The 12-in.-dia wheel can have a face as wide as 3 in., the 14-in. wheel a face up to 4 in. wide. The spindle oscillates on tapered roller bearings, with a variable stroke of 0 to 2 in., at a frequency of 50 times a minute.

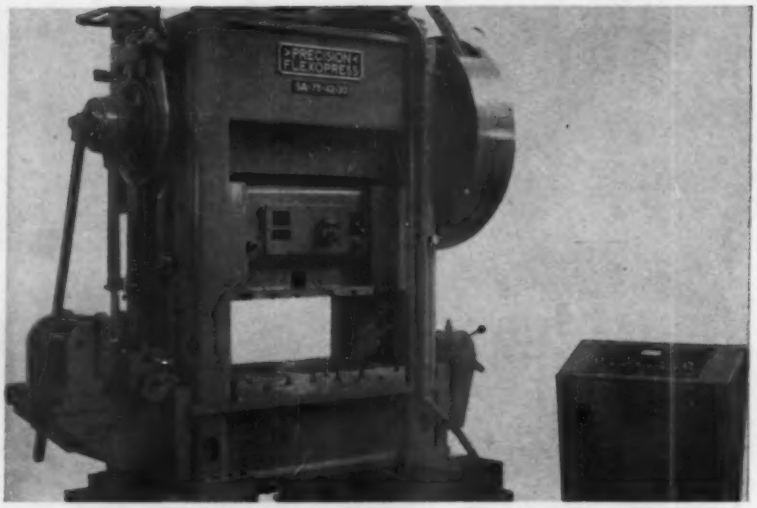
Each new model has two tables, and each set of tables can be mounted in two positions. In the up position (illustrated) the tables tilt at a point 4 in. below the wheel centerline. In the low position, the rockers are removed and the tables are mounted horizontally, 10 in. below the wheel centerline. This latter position accommodates large fixtures or work.

Hammond Machinery Builders, Inc, 1618 Douglas Ave, Kalamazoo, Mich

MORE DATA? Circle 129, inside back cover

Segal Cam and Roller Drive Index Table Positions Heavy Workloads

The large non-rotating center on the Segal cam and roller drive index table may be tooled to mount auxiliary equipment for drilling, tapping, staking, clamping, inspection and ejection. The machine's table can be furnished completely tooled to special requirements and can be set up with an odd number of stations or for double advance. The cam and roller design is said to provide



75-TON MODEL FLEXOPRESS is a high-production model that is said to have created a new standard for mechanical presses. At the show a precision double-roll feed and scrap cutter with an in-motion adjustment will be mounted on the 75-ton unit.—*Precision Welder and Flexopress Corp, 3520 Ibsen Ave, Cincinnati 9, Ohio*

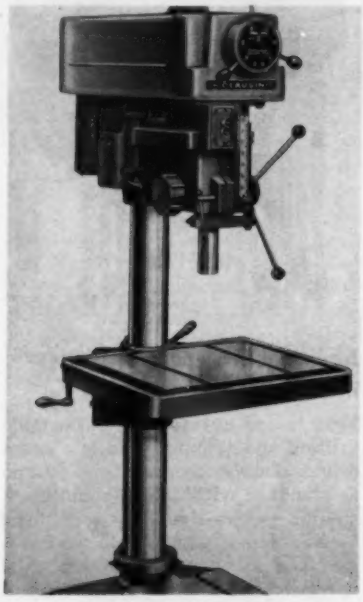
MORE DATA? Circle 128, inside back cover

smooth acceleration and deceleration for heavy workloads without backlash.

Other features of the machine are a transparent access window for observation of cam and pins during setup, positive lubrication system for the entire table and an internal switch-arrangement for impulsing external equipment at any point.

Edward Segal, 132 Lafayette St, New York 13, NY

MORE DATA? Circle 130, inside back cover



Clausing Offers 20 In. Drill, Geared Lathes, Vertical Mill

These 20-in. heavy-duty drills are capable of drilling holes to ⅞ in. in steel and 1⅛ in. in cast iron. The No. 3 Mt spindle has a speed range from 150 to 2000 rpm and a 6½ in. travel. The drillpresses are available with a choice of two countershaft drives; positive power variable speed, or step-pulley models with 5 or 10 speeds. Other features include 4-in. ground steel column, 19½ by 22 in. table, and choice of hand or gear driven power feed.

Geared head lathes equipped for high speed thread cutting come in three sizes, 13, 15, and 17 in., are said to enable an operator to cut threads 5 times faster than by normal methods, thread tight to a shoulder at max speed, cut internal threads without undercutting, and eliminate rejects incurred in threading.

Back geared lathes have hardened bed ways, forged steel spindle, 11/16-in. collet capacity and choice of 10 speed countershaft, or variable speed drive, both with clutch and brake optional.

The Clausing vertical mill machines at all angles with one work setup. Its precision spindle head contains 7 ball bearings. The mill comes equipped with micrometer depth stop control, 6 by 24 in. table, and hand or power feed.

Clausing Div, Atlas Press Co, 24-101 N Pitcher St, Kalamazoo, Mich

MORE DATA? Circle 131, inside back cover

Low Frequency Demagnetizer Gives Full Field Penetration

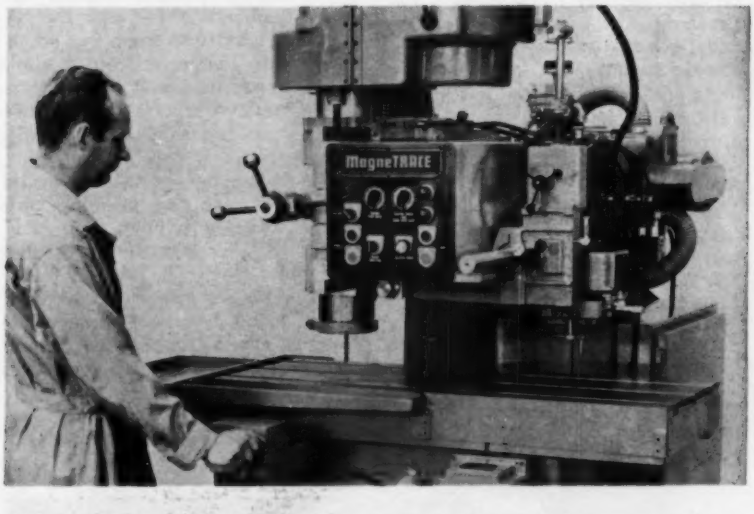
A new low frequency demagnetizer is said to overcome the problem of obtaining full penetration of the demagnetizing field into large, magnetized workpieces. It works on the principle of subjecting the workpiece to a very strong magnetic field alternating in polarity at a much lower frequency than 60 cps.

This lower pulse rate, combined with the powerful field, permits full penetration of the demagnetizing field into the workpiece, causing more complete demagnetization of larger and heavier workpieces than heretofore obtainable.

The balanced alternating magnetic field may be smoothly decayed automatically until the workpiece is completely demagnetized, or, to accomplish the same result, the workpiece may be gradually removed.

O S Walker Co, Inc, Worcester, Mass

MORE DATA? Circle 132, inside back cover



Magnetrace With Automatic Programming Does Tracer-Controlled Profile Milling

The Magnetrace, a tracer-controlled profile milling machine (*AM*—Nov 16 '59, p184) does continuous milling of simple or complex shapes from 2-dimensional master templets. It is now available in two models with automatic program control:

• Model A is recommended where the work is profile milling at constant cutter level, or where it is desired to make spindle height changes manually. It performs such functions as turning on and off spindle and coolant, automatic fixture clamping, and in-cycle functions—at any preselected points—such as automatic feed rate changes, automatic changes from climb to conventional milling, and automatic positioning of stylus height to different templet levels.

• Model B can perform all the functions of Model A as well as vertical feeding of cutter spindle, rapid down-feed of cutter spindle, drilling into work with machine motion stationary, rapid vertical retract of cutter spindle, and auxilliary functions such as automatic indexing of fixture or templet during the cycle.

Seven spindle speed changes give a range of 375 to 5200 rpm; a special spindle drive is available for additional spindle speeds of 75, 100, 150, and 280 rpm.

The machine is made by New England Machine and Tool Co, Berlin, Conn.

Pratt & Whitney Co Inc, West Hartford 1, Conn

MORE DATA? Circle 133, inside back cover

1961
TOOL SHOW IN PRINT

Cincinnati Sub-Zero Introduces Chilling, Thermal Shock Chambers

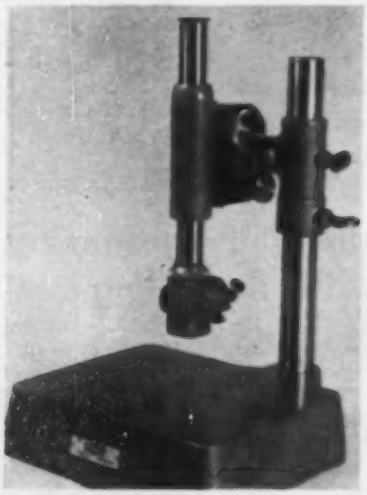
The Penquin 5 environmental tester occupies less than 2½ sq ft of floor space and can produce temperatures from —10 to —60 F and up to 500 F in its 0.5 cu ft chamber. The chamber is 15 in. long, 9 in. wide, and 8 in. deep and has 2½ in. of insulation.

Thermal shock chambers added to the manufacturer's line include the Ultratemp 600 and Ultratemp 800. Model 600 is designed for operation between —100 and + 500 F with a 5-min pulldown and 30-min warmup.

Ultratemp 800 has a low temperature of —320 F and a high temp of 500 F. Both models are instrumented to an accuracy of ½ deg F.

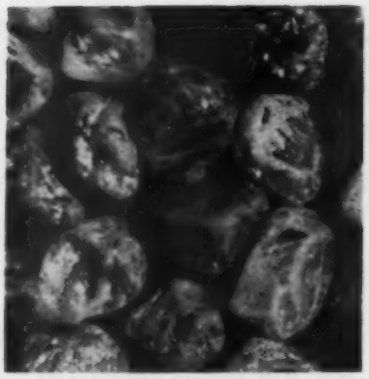
Cincinnati Sub-Zero Products, 3932 Reading Rd, Cincinnati 29, Ohio

MORE DATA? Circle 134, inside back cover



MICRO-INTERFEROMETER is part of line of depth measuring equipment that includes parfocal projection microscopes, dial gages, micrometer screws, and ring type microscope illuminators. Combinations of this equipment can be worked out that reportedly give depth measuring ranges up to 4 in. and accuracies to 0.000,01 in. —*The Gaertner Scientific Corp, 1201 Wrightwood Ave, Chicago 14, Ill.*

MORE DATA? Circle 135, inside back cover



Diamond Tool Research Shows Pressure-Tested Diamond Grit

Because the diamonds have been quality pre-tested during production, this Pressure-Tested diamond grit is said to be different from all other diamond abrasives. During production, extreme pressures break the rough diamonds into sound, blocky grits; flats and pieces with severe internal stresses are broken again and again until only sturdy grains result.

The company reports extensive tests in lapping and grinding carbides, steel, corundum, and diamonds. They report that the new diamond particles have been found stronger than any diamond abrasive in use today, and have distinct advantage for all operations where heavy cutting or grinding pressures are necessary.

Diamond Tool Research Co, Inc, 380 Second Ave, New York 10, NY

MORE DATA? Circle 136, inside back cover

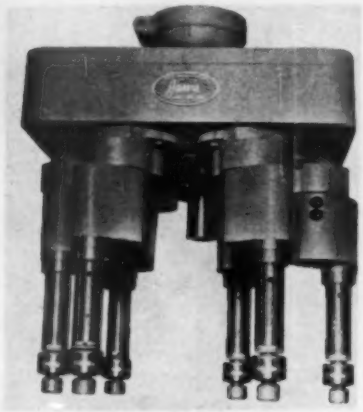
Supreme Products Keyless Chuck Said Not To Jam, Slip, or Mar

The Mercury Mark II, a new lightweight keyless chuck for portable drills, is said to have the precision and features of higher priced chucks in that it will not jam, slip, or mar drill shanks. Because aluminum and plastic are used in the construction, it weighs less than half as much as earlier model keyless chucks.

The chuck, which has a 0 to ¼-in. capacity, will fit all portable drills with a ⅜ x 24 spindle.

Supreme Products Corp, 2222 S Calumet Ave, Chicago 16, Ill

MORE DATA? Circle 137, inside back cover



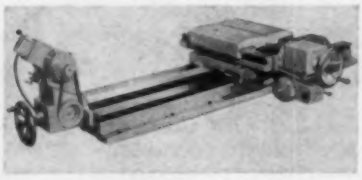
Jarvis Multi-Spindle Drilling Head Takes 1-In. Dia Drills

This extra-heavy-duty adjustable drilling and tapping head is a gear-driven double eccentric type offered as standard with 2 to 6 spindles. A similar, extra-light-duty drillhead of the same design is also available for floor or bench drillpresses.

Also offered is the Dril-King, a floor-mounted, self-contained, universal joint drilling and tapping machine, designed for light duty applications. Features of the unit are a 6 by 8 in. work area, 12 spindle drivers,, minimum center distances of 5/16 in., four speed selections and T-track vertical feed table.

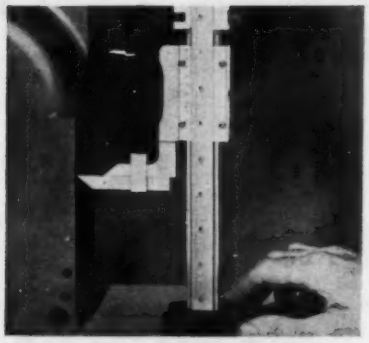
Jarvis Corp, Middletown, Conn

MORE DATA? Circle 138, inside back cover



MASTER FEED BASES come with powered screw feeds and dial feed controls. These dial-controlled feed units provide dial-selected feed rates of ½ to 40 ipm. Six sizes of feed bases are made with optional bottom slide travel capacities ranging from 3 in. up to 15 ft—*Master Mfg Co, Inc, 1300 E Ave A, Hutchinson, Kan*

MORE DATA? Circle 139, inside back cover



Starrett Height Gages Feature Flush-Fit, 50-Division Vernier

Height gages, with a long, 50-division vernier that has widely spaced graduations, have the vernier scale flush fitted in the same plane as the main scale to insure exact alignment of matching lines on bar and vernier.

The gages also have a no-glare finish on all reading surfaces, a hardened and stabilized master bar, and combination straight and angular ways for positive alignment of bar and slide. Gages are offered in 12 and 18-in. sizes.

The L S Starrett Co, Athol, Mass

MORE DATA? Circle 140, inside back cover

Cutter and Tool Grinder Has Helical, Radial Attachments

The latest model Kuhlmann, cutter and tool grinder, called Model FSM, is equipped with helical and radial grinding attachments. According to the manufacturer this machine will handle the re-sharpening and restoration of practically all types of cutters and tools; it is really a universal tool grinder.

The grinding table, which runs on hardened and ground adjustable V-guides has an upper part which can be swivelled 90° to either side. It also has a 360° indexing head which is equipped with a 24-position indexing disk. Because of this, cutting angles don't have to be changed during frequent re-sharpening.

The grinding spindle, which is free from oscillation and play because of high precision ball bearings, runs in both directions at either 3000 or 6000 rpm. Special flanges with differential screw make changing of the grinding wheel easy.

Antares Instruments Inc, 55-02 37th Ave, Woodside 77, NY

MORE DATA? Circle 141, inside back cover

Marking Machines Introduced

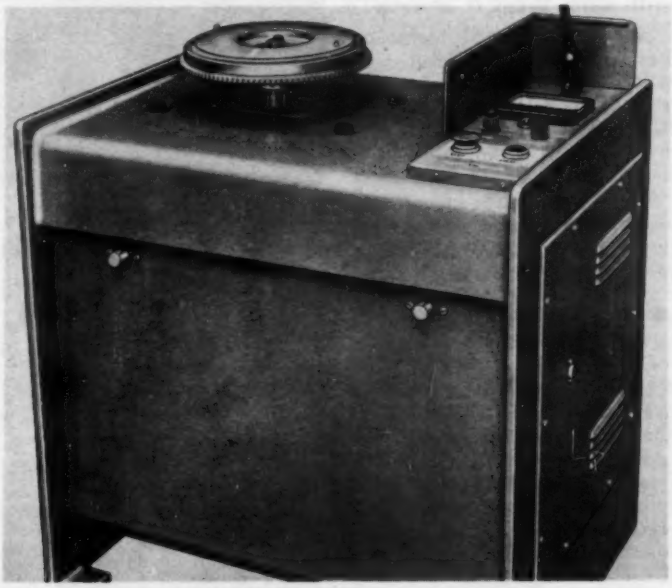
Being introduced at the Show are two of the company's new marking machines: the Model OC-2, two-color high-speed ink press for cylindrical objects, and the Model EA-10 air-operated hot stamp for flat items. In addition, the company will display its automatic, semi-automatic, and hand-operated machines for most any surface and shape.

Apex Machine Co, 14-13 118th St, College Point 56, NY

MORE DATA? Circle 142, inside back cover

SUPER MARGIN high speed jobbers drills come in sizes 1/16 to ⅜ in. and No. 1 to 52, letters A to W. Drill, which sells at no premium in price, has super margins, Redi-Thin web design, dual purpose lips, and Perma-Mark hardened shanks—*Avildsen Tools & Machines, Inc, 100 Lafayette St, New York 13, NY*

MORE DATA? Circle 143, inside back cover



Stewart-Warner Single Plane Balancer Gives up to Four Modes of Operation

This new electronic vertical, single-plane balancer uses the strobe light and other principles used in S-W cradle-type and portable industrial balancers. However, it is claimed both simpler and faster to operate than cradle-type devices, and to make production balancing economically feasible for the first time for many types of production.

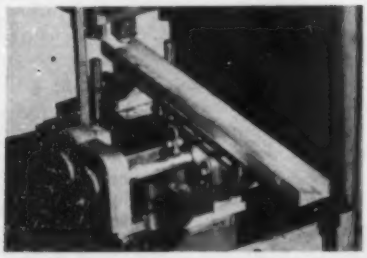
The vertical balancer—which can check any rotative parts up to 200 lb and 30 in. dia—has four potentiometers which permit four separate calibrations of the meter. Thus the calibration for a production run of one size of pulley, for example, could be "saved," and another pulley balanced on the same machine without upsetting the first calibration. Conceivably, in production work, three calibrations would be saved, with the fourth position kept clear.

Retail price of this Model 2409 vertical balancer is $2750, FOB.

Stewart-Warner Corp, 1826 Diversey Pkwy, Chicago 14, Ill

MORE DATA? Circle 144, inside back cover

1961
TOOL SHOW IN PRINT



Press Unloader Carries Work Up with Ram, Drops It in Tray

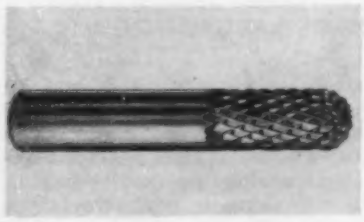
This standard gear and rack-type of press unloader is engineered to catch workpieces which are carried up with the ram. At the top of the stroke, the positive knock-out of the press ejects the workpiece into an extended tray which lets it slide out of die and then automatically retracts the tray as ram descends.

The standard unloader can be adapted to any stroke press, and can be used in a wide range of stroke lengths and speeds. Also, since all of the stroke is not used, the unloader can be placed much closer to the die proper, as all unnecessary travel of the tray is eliminated.

Other features: tray widths can suit span between guide pins of die; tray is adjustable to best working angle; trays are interchangeable for different workpieces.

Livernois Engrg Co, 24200 Trowbridge, Dearborn, Mich

MORE DATA? Circle 145, inside back cover



Refractory Metal End Mill Counterbalances Turning

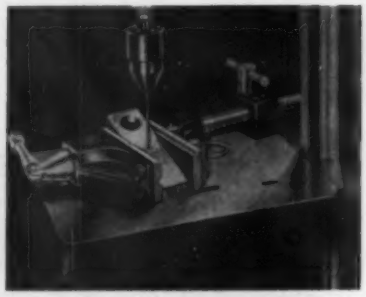
A new type solid carbide end mill for refractory metals to Rh 50C is called the Master Mill. Because it tends to counterbalance the right hand turning action of the spindle, it gives a neutrally-stressed tool free of any tendency to pull forward, grab, or chatter.

The mill, because of its multiple number of teeth, retains its edge sharpness on refractory metals for much longer than a conventional 2 or 4-flute mill. According to the manufacturer, it is easier on the machine, requires less power, and has less load per tooth.

The mills are available in sizes up to 1-in. diameter in solid carbide; all sizes are also available in ball end style.

The Metal Removal Co, 1801 West Columbia Ave, Chicago 26, Ill

MORE DATA? Circle 146, inside back cover



AMF Chuck Allows 2-Sec Tool Change; Vise Aids Angle Drills

The fully-automatic Wahlstrom chuck permits tool changing in just two or three seconds; the Float-Lock drill press vise is said to turn a drill-press into a complete machine tool.

With the chuck, there is no waiting for the spindle to stop. Four hardened and ground jaws automatically center the tool and provide a grip that cannot slip or chew up shanks. But, the greater the load, the tighter the grip.

The instant-change vise is said to assure positive anchoring on the drill-press table. Because it floats and locks in any position, it is claimed excellent for angle drilling, as a low-cost jig, or for holding small fixtures.

American Machine & Foundry Co, 261 Madison Ave, New York 16, NY

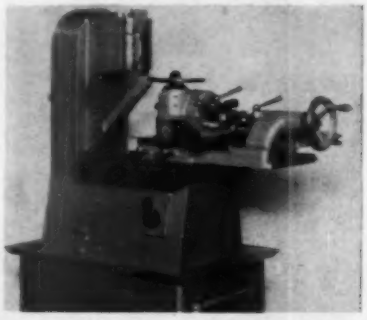
MORE DATA? Circle 147 inside back cover

Centering Vise Holds Workpiece in Three-Point Concentric Grip

The Malcus centering vise clamps on top of a universal table or directly on the table and will grip workpieces with a three-point concentric grip that is said to prevent damage to tubing and other easily bent stock. Specially designed for holding work in milling machines, the vises have bases that permit clamping vertically or horizontally. A reversible supporting block with V-shaped slots of different widths accommodates large and small workpieces in the same vise.

Malcus Tools Corp, 1270 Broadway, New York, NY

MORE DATA? Circle 148, inside back cover



Cam Shaper Makes Sharp Radii Not Possible on Milling Cutter

This cam shaper (shown in combination with the Strohm cam milling attachment) was designed specifically for the manufacture of flat and bell cams for Swiss-type and other automatics actuated by cams. It is said to give economical production of the most intricate cams which have deep recesses and sharp radii and therefore which cannot be produced satisfactorily with a milling cutter.

Capacity of the machine—which has a ½-in. stroke and 2 speeds adjustable to 600 or 700 strokes a min—is flat cams of 9⅞-in. maximum dia, and bell cams up to 7⅞-in. dia and 6½-in. deep.

The company is also displaying Cepa centrifuges for drying, washing, degreasing of machined components, and recovery of cutting oil; and the Doebeli carbide tool grinder. This grinder, made for grinding and lapping cutting tools, has diamond wheels for grinding and lapping mounted on the same shaft, side by side.

Hudson Automatic Machine & Tool Co, 137 38th St, Union City, NJ

MORE DATA? Circle 149, inside back cover

Mohawk Displays Drill Point Thinning, Sharpening Machines

Quick loading and changing from one drill diameter to another are features of an adjustable drill point thinning machine just added to the company's line of drill sharpening

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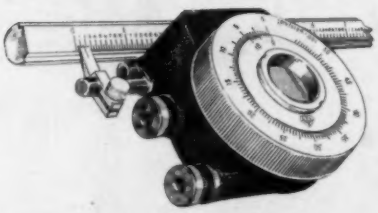
equipment. Also on display are the new drill point sharpening machine, special sharpening tools, and a resharpening fixture.

Mohawk Tools, Inc, Montpelier, Ohio

MORE DATA? Circle 150, inside back cover



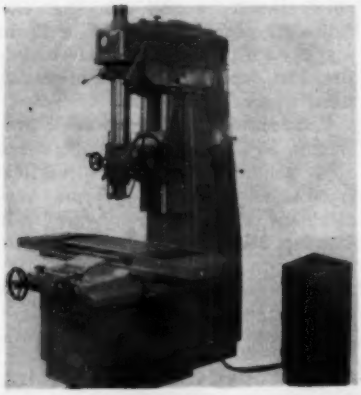
Machine Tables Repositioned to 0.0001 in. With Optical Reader

Ever-true optical micrometric reader is said to cut time required for repositioning machine tables or relocating work points by presenting measurements to 0.0001 in. on a large bright screen. The machine scans scales attached to a machine table that are reportedly accurate to 0.0002 in. in any 40 in. of length.

Errors induced by faulty machine setting, backlash, and worn lead screws can be overcome with the reader, which sells complete with all alignment tubes, brackets, etc, for $735.00.

Edgcomb Engrg & Engraving Co, 1105 North Hollywood Way, Burbank, Calif

MORE DATA? Circle 151, inside back cover



Scales Are Viewed From Front Of Table On Olympia Optical Borer

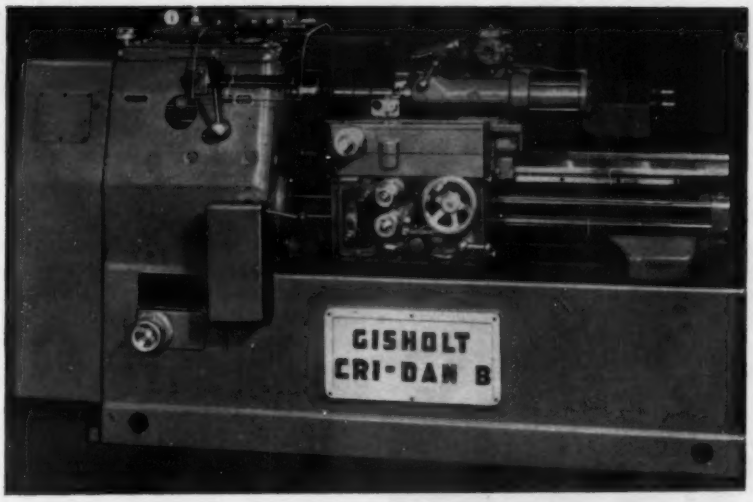
This new optical jig borer has a worktable of 17¾ in. by 32½ in. and travels of 13¾ in. by 21½ in. The machine has precision optical scales mounted underneath and in the middle of the table and viewers for both scales in the front of the machine. The drive to the spindle has an infinite range of speeds from 40 to 2100 rpm.

The depth control mechanism, which provides four feed rates, has an electrically operated clutch system that provides accuracy in automatic depth control.

A mist lubricating system and an electric brake are features of the spindle.

Amitool Co, Inc, 629 Main St, Westbury, LI, NY

MORE DATA? Circle 152, inside back cover



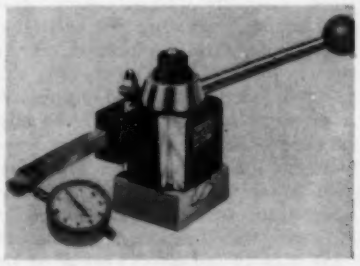
Gisholt Automatic Threading Lathe Cuts Threads With Single-Point Carbide Tool

Cri-Dan B automatic threading lathe equipped with a tracer will cut highly accurate threads with a single-point carbide tool. With an 8 to 15 min setup, course or fine, left hand or right hand, straight or tapered threads can be cut right up to shoulders on all types of internal or external threading operations.

A 10½ in. long, 1⅝ in. dia diesel engine stud with a stepped outside diameter, and a 2¼ long, 1½ in. dia, single-start 8-TPI thread can be machined on the lathe in only 1 min 40 sec, not removing workpiece.

Gisholt Machine Co, 1245 E Washington Ave, Madison 10, Wisc

MORE DATA? Circle 246, inside back cover

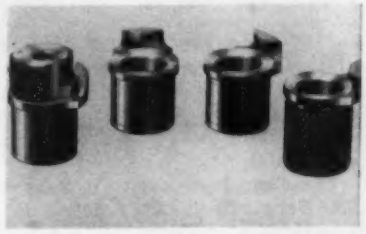


Aloris Toolpost Guaranteed To Maintain Accuracy of 0.0001 In.

This tool post has a patented, tapered, sliding gib toolpost pulling in on the holder that gives a positive lock and enables the manufacturer to guarantee 0.0001 in. accuracy. All surfaces are hardened and ground and the tool is said to maintain its high accuracy throughout repeated tool changes, even when deep boring.

Aloris Tool Co, Clifton, NJ

MORE DATA? Circle 153, inside back cover



TUNGSTEN CARBIDE DRILL BUSHINGS have approximately fifty times the wear life of ordinary steel bushings, according to the manufacturer. Types available in the new line include head and headless press-fit, fixed and slip renewable bushings—*American Drill Bushing Co, 5107 Pacific Blvd, Los Angeles 58, Calif*

MORE DATA? Circle 154, inside back cover

1961
TOOL SHOW IN PRINT

Cleveland Polar Recorder Measures, Records Roundness

This polar recorder was designed for use with the company's Ex-Ac mounted on a precision spindle machine such as a jig-borer or jig-grinder. It then measures and records the roundness, concentricity, and squareness characteristics of a part within the accuracy of the machine spindle. Standard recorder is equipped with a 2 rpm synchronous motor to correspond with machine speed.

Because the recording pen is electrically operated, the instrument gives a non-smearing permanent record. It may be secured with a 1 or 5 milliamp movement, depending on speed of response (detail) required. Normal magnifications up to 10,000X (0.000,010 in. per division) can be read.

Cleveland Instrument Co, Subs of The Bendix Corp, 6220 E Schaaf Rd, Cleveland 31, Ohio

MORE DATA? Circle 155, inside back cover

Drill Holder Accepts All Tools Without Bushings or Sleeves

The Model U universal drill and reamer holder will hold any size shank up to its maximum capacity without bushings or sleeves, because tools are held firmly in a precision V which insures accurate location of tool in holder.

The holder is adjustable to compensate for misalignment between turret and spindle. All parts are made from heat treated alloy steel, with mating surfaces precision ground for easy adjustment and rapid setup.

Also on display is a newly developed deep hole drilling attachment for turret lathes. This completely adjustable, self-contained unit fits into any hole on the turret without interferring with other positions. Its electrical power lead gives full 360° rotation without entangling lead cord.

Boyar-Schultz Corp, 2000 S 25th, Broadview, Ill

MORE DATA? Circle 156, inside back cover

German Universal Copy Shaper Is Hydraulically Operated

The Anderle hydraulic copy shaper, Type URK, manufactures irregular-shape punches, intricate brass EDM electrodes, form tools, extrusion dies, and the like. It consists of a regular shaper ram and a hydraulically controlled universal table.

Table construction permits power feed of the workpiece to be switched from circular into traverse motion without affecting the accuracy.

Tracer stylus is mounted on an arm in front of the shaper. It is adjustable horizontally and vertically; a pressure on the stylus from any direction has an effect on the vertical motion of the table. The templet is located in front of the machine, concentric with workpiece.

Other specifications: stroke of ram, 0 to 12 in.; size of table, 12 by 14 in.; distance between centers, 0 to 11 in.; max size of tool, ⅝ by 13/16 in.

Dist by Mercuria Co, 3710 South Western Ave, Chicago 9, Ill

MORE DATA? Circle 157, inside back cover

All-Pneumatic Marking Machine Gives Uniform Impression Depth

The Model 574 is an all-pneumatic, general purpose marking machine that has all its operating mechanism in a compact Duomatic head. This head is comparable to an air or hydraulic press and supplies both marking pressure and horizontal die slide travel for roll marking. Because air pressure controls depth of mark, each piece has a uniform impression depth regardless of variations in work thickness.

Condensed specifications are: height, 58 in.; width, 11¼ in.; depth 15¾; weight, 200 lb; 3⅜-in. vertical handwheel adjustment; ½-in. vertical air stroke; 3½-in. die slide stroke; 8¾-in. gap; 3-7/16 reach; 6 x 8½-in. table.

Noble & Westbrook Mfg Co, East Hartford, Conn

MORE DATA? Circle 158, inside back cover

Dry Adhesive Film Said To Solve Production Laminating Problems

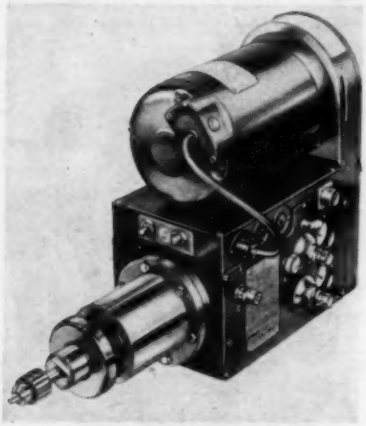
Auburn 18 is a new 2 mil, industrial thermosetting dry adhesive film on a paper interliner which permits cutting or preforming to exact size and shape required for optimum mating of the pieces. It was designed as a practical solution to production laminating problems.

The film, which is for use in the electrical and metalworking indus-

tries, provides carefully controlled thickness for a uniform adhesive layer at the glue line, and the bond, after cure, is said to be heat resistant and to withstand exposure to water solvents and hydrocarbons.

Auburn Mfg Co, Middletown, Conn

MORE DATA? Circle 159, inside back cover



Dumore Drilling Units Actuate Equipment in Automatic Set-Ups

Spindle speeds of 800 and 15,000 rpm for drilling holes from approximately 0.20 to ¼-in. dia are offered with this new high-speed automatic drill. Two models are available: Series 34 and Series 36. Series 34 drill units are equipped with an electrical interlocking circuit for actuating related equipment in automated setups and both series have an air pressure interlock system to permit correlation of other machinery with drill-unit action by means of air-actuated switches.

Automatic cycling, stroke length, advance rate, retract rate and spindle-speed adjustment are other features of the units.

The Dumore Co, 1300 17th St. Rachine, Wisc

MORE DATA? Circle 160, inside back cover

O S Walker Combination Chuck Eliminates Thermal Problems

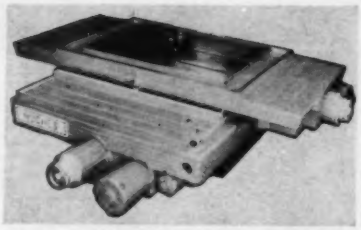
This new Electroperm Chuck is said to eliminate the problems caused by heat generation when holding large ferrous workpieces because this new chuck development, which combines permanent magnets with electric coils, eliminates distortion due to thermal expansion.

Electric current turns the chuck on but, once it is electricaly energized, permanent magnets take over to provide the magnetic holding power during machining operations. As well as eliminating the problem of thermal expansion, the permanent magnetic holding also eliminates the danger of power failures. The chucks use specially timed electrical controls to effect proper magnetization and demagnetization of the unit.

Similar in appearance to the standard electric chucks made by the company, these new electric-permanent magnetic chucks are available in a complete range of sizes from 12 x 24 to 42 x 96 in.

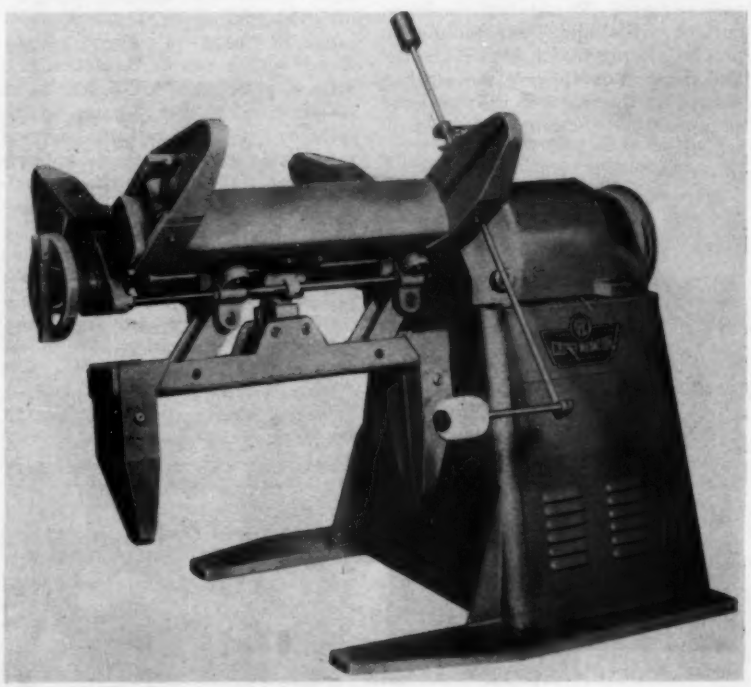
O S Walker Co, Worcester, Mass

MORE DATA? Circle 161, inside back cover



MT-4 NUMERICAL CONTROL SYSTEM gives ± 0.001-in. per ft accuracy and ± 0.0005-in. repeatability to this 38 x 22-in. table that has ½-in. T-slots. The two axes, which position simultaneously, operate at between 150 and 180 ipm under automatic, setup (semi-automatic for tape and program checking), or manual operation. System uses standard tape code on 1-in., eight-track tape — *Industrial Systems Div, Hughes Aircraft Co, P O Box 90904 Airport Station, Los Angeles 45, Calif*

MORE DATA? Circle 162, inside back cover



Cooper Weymouth Powered Stock Reel Has 2500-lb Capacity, Electric Disk Brakes

Heavy duty stock reel supplies up to 2500 lb of coil stock to presses and feeding accessories. The reel is power-driven and can be synchronized with presses by means of a loop-arm-actuated mercury switch. Coils are automatically centered on the reel, which is equipped with electric disk brakes and ball bearings on all rotating parts. A 1½-hp, 3-phase motor powers the machine. Reels come in 12, 18, 24-in. stock sizes with a max OD of 40 in., min ID of 15 in.

Cooper Weymouth Inc, Stratford, Conn

MORE DATA? Circle 163, inside back cover

1961
TOOL SHOW IN PRINT

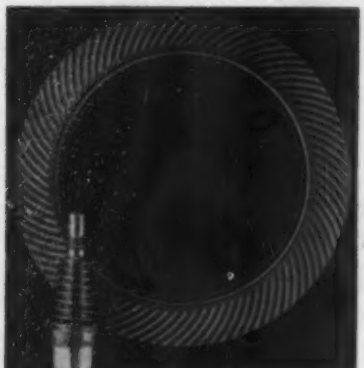
DeVlieg Announces Machine That Presets Precision Cutting Tools

A new machine—which allows precision cutting tools to be preset to the rigid standards demanded by continuously-operated, numerically-controlled machine tools—will be in the firm's booth as part of their presetting clinic. It is said to represent another step toward the elimination of machine tool downtime for changing cutting tools.

The new precision tool presetting machine will be demonstrated in the presetting of boring bars, milling cutters, drills, and other tooling to precise tolerances for both diameter and depth. For viewing the cutting tool point, the machine uses a precision measuring and optical system which can be read directly to 0.0001 in. without interpolation.

Microbore Div, DeVlieg Machine Co, Fair St, Royal Oak, Mich

MORE DATA? Circle 164, inside back cover



HIGH REDUCTION HYPOID GEAR has "wrap-around" teeth to make it extremely well suited for high reduction, strength, and compact design, according to manufacturer. Result is a conical pinion which permits continuous tooth action even with just one or two teeth and, compared to corresponding bevel pinions, its diameter is greater for higher strength. These are available in ratios of 1:10 to 1:300—*Gleason Works, 1000 University Ave, Rochester 3, NY*

MORE DATA? Circle 165, inside back cover

Sunnen Products Honing Machine Has Easy-Select Spindle Speeds

This new heavy duty honing machine is said to be specially designed for industrial needs. It has a wider range of "easy-to-select" spindle speeds and a double reduction belt drive that delivers full power at all speeds from a ½-hp motor to the spindle. This drive is fully enclosed to promote safety, improve appearance, and insure a long life of trouble-free service, according to manufacturer.

Using only standard tooling available from stock, the new machine is said to handle any honing applications on 0.100 to 2.625-in. bores; bores up to 5.500 in. can be honed with tooling built to order.

Sunnen Products Co, Dept H-4, 7910 Manchester Ave, St Louis 17, Mo

MORE DATA? Circle 166, inside back cover

Burring and Sharpening Tool Features Carbide Insert Blades

Because this new burring and sharpening tool has carbide insert blades and a new camming feature for advancing the edges, it compensates for wear at the blade intersection. The standard tool can edge-burr sheet-metal, plastic, or glass up to 1/16 in. wide; special blades are available for sizes above 1/16 of an inch.

The cast aluminum handle is milled and counterbored to provide positive location for both blades and cam. A spring-steel clamp retains and guides the insert blades.

Crodian & Co, 4897 Kessler Blvd, East Drive, Indianapolis 20, Ind

MORE DATA? Circle 167, inside back cover

Sheffield's Ferranti Measurer Displays Coordinate Readings

The Ferranti FI-22 measuring machine — designed for fast, precise measuring of the location of holes and surfaces of parts in two dimensions—displays X and Y coordinate readings simultaneously by means of lighted numerals on the panel above the gage table. Gaging accuracy over a 15 to 24-in. range is said to be better than 0.001 in.

The instrument can be used also for layout and scribing operations; to center punch precision parts with highest accuracy; and, through the use of air or electronic gage cartridges or a toolmaker's microscope, it handles many other inspection problems.

Sheffield Corp, Subs of The Bendix Corp, Dayton 1, Ohio

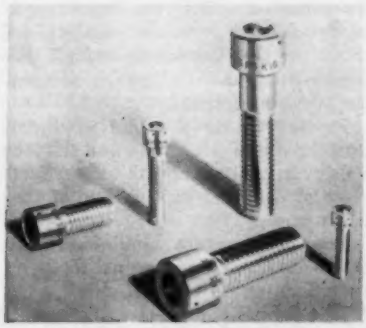
MORE DATA? Circle 168, inside back cover

Epoxy Paste Is Easily Carved

Ren-Shape, a fast curing epoxy paste material, is recommended for building and duplicating male and female parts. New tube containers make mixing small amounts easy: Ribbons of resin and hardener are squeezed out, mixed, and applied; no weighing is necessary. The hardened paste can be carved and worked easily.

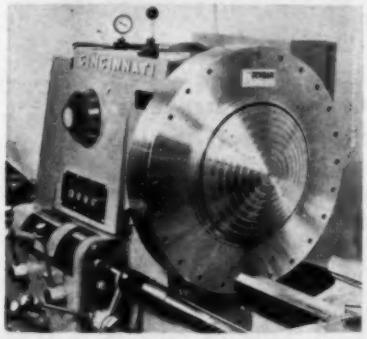
Ren Plastics Inc, Lansing, Mich

MORE DATA? Circle 169, inside back cover



UNBRAKO K-SERIES of high fatigue tension fasteners for critical high-strength applications consists basically of socket-head capscrews in shape and dimensions, but they have twice the fatigue strength of their standard industrial counterparts, according to company—*Standard Pressed Steel Co, Jenkintown, Pa*

MORE DATA? Circle 170, inside back cover



Chucking System Holds Missile Components up to 100-in. Dia

This new missile vacuum chucking system is designed to hold missile and aircraft components such as ceramic nose cones and stainless parts up to 100-in. dia. Activated by a vacuum pump with hold-down pressure of 12 psi, the chuck develops over 33,000 lb of distortion-free hold-down pressure on a 60-in. dia part. An automatic safety device prevents loss of vacuum in case of power failure.

Special designs are said to allow boring ID and facing and turning OD concentric within 0.001 in. on parts up to 100-in. dia.

The Dunham Tool Co, Inc, Box 18, New Fairfield, Conn

MORE DATA? Circle 171, inside back cover

Ferguson Machine Drive Takes Loads up to 10X Rated Capacity

Vari-power machine drives for fast-start, slip-clutch, or pulsating-load applications attain top speed instantaneously and meet momentary peak load requirements up to ten times rated capacity. The unit may be coupled directly, or through a timing belt to a worm speed reducer and is also available as a variable speed drive.

A new line of standard cam indexed roll feeds are capable of speed up to 700 strokes a minute. The indexing mechanism is rated for 8,000 to 20,000 hrs operation without maintenance. Standard increments of feed range from 1⅝ to 6 in. for stock up to 18 in. wide.

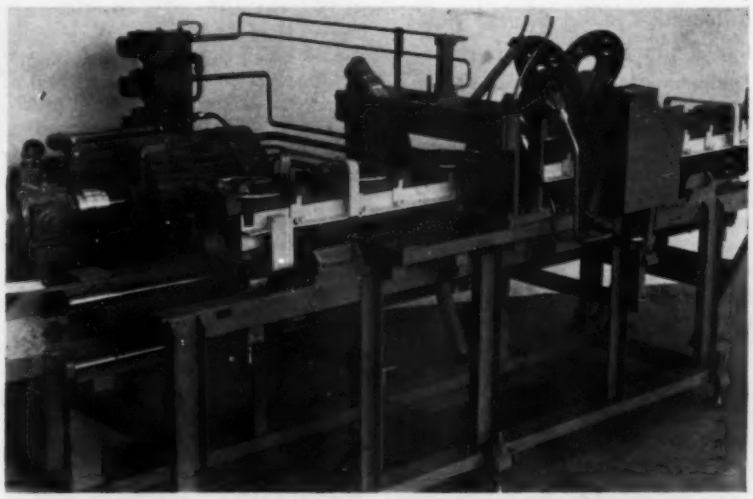
Other products introduced are indexing mechanisms rated for speeds up to 2,000 precision indexes per min, index tables, standard plate barrel and face cams, a Trans-O-Mator in-line assembly machine base, and an assembly machine that has interchangeable chucks and collets.

Ferguson Machine Co, 7818 Maplewood Industrial Ct, St Louis 17, Mo

MORE DATA? Circle 172, inside back cover

AIR COLLET CHUCK is said to convert any machine tool to 5C size. The self-contained air-actuated collet adapter is designed for secondary chucking, not for through work. Truing screws permit adjusting to 0.0005 in. tir; special rotary union works up to 3000 rpm —*The Dunham Tool Co, Inc, New Fairfield, Conn*

MORE DATA? Circle 173, inside back cover



Livernois Building-Block Transfer Unit Pierces, Turns Over Parts Automatically

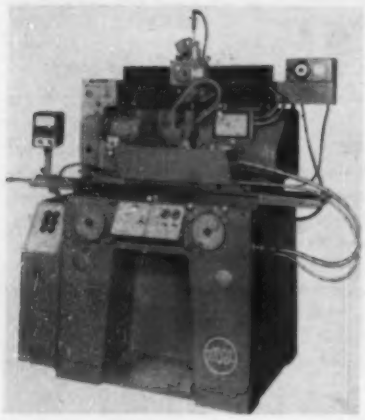
Automatic transfer mechanism designed on the building block principle reaches into a press, removes a part from the die, and moves it along the line. Hydraulic piercing units then pierce the part and it is fed to a turn-over device that orients it automatically for another stamping operation.

In this design, the hydraulic supply for the piercing cylinders powers the turn-over device and, in addition, the turn-over device is controlled and timed to operate while the transfer unit is returning.

The hydro-pierce units on each side of the axle station operate alternately to produce right and left-hand parts. During this piercing operation ,the part is clamped in position by a vertically mounted cylinder, also operated from the same hydraulic supply as the piercers.

Livernois Engineering Co, 25200 Trowbridge, Dearborn, Mich

MORE DATA? Circle 174, inside back cover



Automatic-Cycling Grinder Holds 0.00005-in. Repetitive Accuracy

Designated Model FH-100, this electro-hydraulic cylindrical grinder has a 3½ by 12-in. capacity. Automatic operations of the grinder include, cycling with rapid advance of the wheelhead, rough-finish feeds at predetermined feed rates, variable spark-out period, rapid retraction of wheelhead, table traverse, coolant flow, and switch-off of all components upon completion of cycle.

A constator unit compensates for variations in temperature and viscosity of the hydraulic oil during the working day and maintains wheelhead movements constant at the values preset on the control panel. Repetitive accuracy and uniformity of work is reportedly 0.00005 in.

Austin Industrial Corp, 76 Mamaroneck Ave, White Plains, NY

MORE DATA? Circle 175, inside back cover

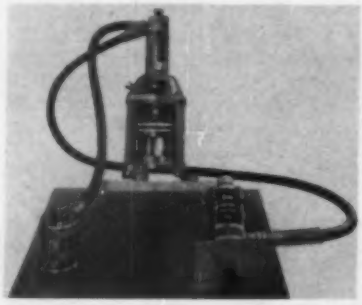
Second Operation Machine Does Several Operations at Same Time

The M-S-O — a new secondary-operation machine which will be in operation during the Show — performs such operations as spot facing, countersinking, chamfering, centering, tapping, eccentric turning, milling, deburring, counterboring, box tooling, threading, hollow milling. It can perform several operations simultaneously.

Machine is said to offer important cost reductions through simplicity of indexing and operation and by the elimination of many individual units.

Standard Tool & Mfg Co, 738 Schuyler Ave, Lyndhurst, NJ

MORE DATA? Circle 176, inside back cover



Wilton Midget Power Clamping Tool Secures Small Mechanisms

The new PowRlock is a power clamping tool designed for securing such small items as electric and electronic parts, control mechanisms, and aircraft and missile parts. It will highlight the company's display at the Show.

Also being shown are: the RX-45 milling machine vise, a new lowcost vise accurately machined to precision standards, and the new Low-Boy PowRarm, a 5½-inch positioner which brings the work closer to the bench and allows the operator to work faster, more accurately, and with less fatigue, according to the company.

Wilton Tool Mfg Co Inc, 9525 Irving Park Rd, Schiller Park, Ill

MORE DATA? Circle 177, inside back cover

Punches Travel Horizontally to Make Holes in Vertical Shapes

HZ hole punching units, designed for punching round and shaped holes in flanges of angles and other formed parts, have a punch that travels horizontally. The die, stripper spring, lifter spring and guide are also located in a horizontal position in the holder.

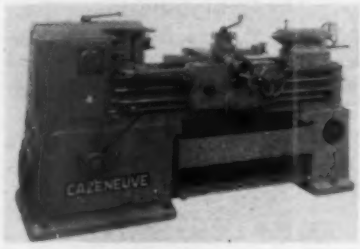
In operation, nothing is attached to the press ram. The ram depresses a wedge-shaped vertical plunger to move the beveled punch against the punch-head and the punch pierces the work horizontally.

By setting up a group of these units in a templet, round and shaped holes can be punched in all vertical sides of a box at each stroke of the press ram.

The punches are available in a range of holder widths up to 2 in. for punching up to ¼-in. mild steel. Max hole diameter is 0.875 in.

Punch Products Corp, 370 Babcock St, Buffalo 6, NY

MORE DATA? Circle 178, inside back cover



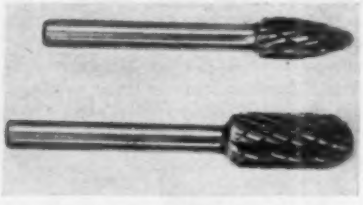
Cazeneuve Tracer Lathe Has Four-Tool Turret

Equipped with a tracer that is accurate to 0.0004 in., the Model HB-500 precision lathe has a four-way tool turret which is accurate to 0.0005 in. Machine is powered by a 12-hp motor with a multiple V-belt drive.

All shafts are mounted on anti-friction bearings, and all moving parts are automatically pressure-lubricated.

Cazeneuve Lathes, 575 E Linden Ave, Linden, NJ

MORE DATA? Circle 179, inside back cover



Starlite Adds Carbide Burrs, Drills, and End Mills To Line

These Starcut carbide burrs for fast removal of aluminum, brass, copper and other non-ferrous metals can be used for dressing welds, and snagging castings and forgings.

Introduced by the same manufacturer are new carbide end mills for high alloy steels and carbide drills for drilling printed circuit boards.

The end mills are made of a special grade of carbide to withstand shock and are available in sizes from 1/32-in. to ¾-in. dia. Printed circuit drills are designed for drilling clean burr-free holes without halo, and are reportedly capable of 10,000 holes per drill.

Starlite Industries, Inc, 58th and Market Sts, Phila, Pa

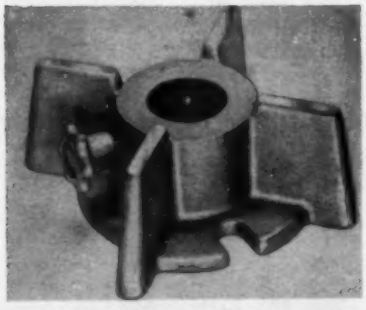
MORE DATA? Circle 180, inside back cover

Cleveland Transistor Thickness Gage Checks 500 Parts per Hour

The Par-Ac gage is designed to accurately determine the thickness of transistor wafers or dice; manually operated, it will check almost 500 parts per hour for segregation into the required size categories. Special scales are available, or unit can be used with the standard scales which allow readings in thousandths, tenths, or millionths.

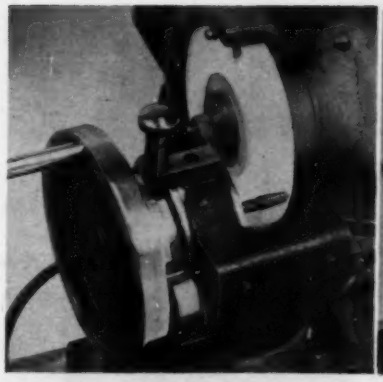
Cleveland Instrument Co, Subs of The Bendix Corp, 6220 E Schaaf Rd, Cleveland 31, Ohio

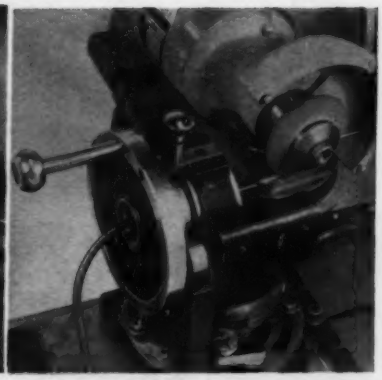
MORE DATA? Circle 181, inside back cover



HANDY PUNCH HOLDER for drilling, assembling, and grinding punches without removing them from the punch plate is self centering and aligning. The semi-steel casting, ground parallel to 0.0005 in., handles shanks from ¾ to 2-in. dia. Price is $19.50—*Montgomery & Co Inc, 401 Morris Ave, Springfield, NJ*

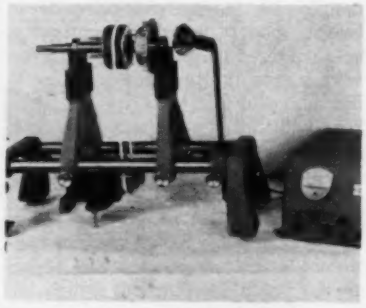
MORE DATA? Circle 182, inside back cover





BENT AND HOOK SHANK TAP GRINDING FIXTURE is said to eliminate the necessity of removing nib-type taps from the shank for flute grinding or relieving of chamfers. Illustrations (above) show: left, with wheel in position, cam follower is engaged for form relieving chamfers on bent and hook shank taps with special grinding fixture; right, index plate plunger is engaged for flute grinding on special bent and hook shank tap grinding fixture—*R-O Mfg Co, Madison Heights, Mich*

MORE DATA? Circle 183, inside back cover

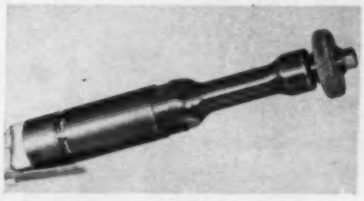


Portable Balancer Eliminates Vibration Down to 10 Micro-in.

The MU-6, a high-sensitive portable balancing system, has a measurable unbalance displacement to 10 micro-in. It works with rotor weights in the range of 4 oz to 100 lb, and requires no hold-downs or foundations. Power requirements are 115 to 125 v, 1 phase, 60 c.

Micro-Balancing, Inc, Herricks Rd, Garden City Park, LI, NY

MORE DATA? Circle 184, inside back cover



Wilson Introduces New Line Of Portable, Heavy Duty Grinders

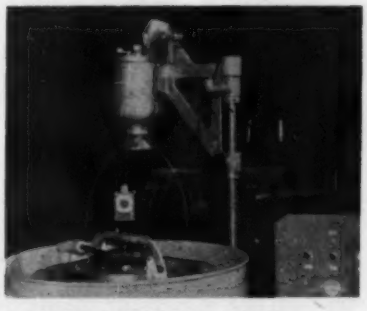
New models in line of Series 922 long-type small-wheel grinders operate at governed speeds of 12,000, 15,000 and 18,000 rpm. The portable grinders feature spindles independently mounted on two widely-spaced bearings to maintain accurate alignment for continuous heavy-duty small-wheel grinding.

Other models introduced include: Series 941 air drills in straight and offset models with drilling capacities to ¼ in. and a choice of seven speeds from 500 to 15,000 rpm.

Series 907 heavy-duty, and 908 extra-heavy-duty vertical pneumatic grinders offered in a choice of four dead and throttle handle positions and straight or lever throttle models. Series 907 speeds are from 3100 to 9,000 rpm; Series 908 speeds are from 3100 to 6,000 rpm.

Thomas C Wilson Inc, LIC, NY

MORE DATA? Circle 185, inside back cover



ELECTRIC INDICATOR GAGE and associated controls are mounted on planetary lapping machine as a size controller for germanium and silicon wafers. Gaging system can also automatically control sorting machinery — *Industrial Products Div, Hamilton Watch Co, Lancaster, Pa*

MORE DATA? Circle 186, inside back cover

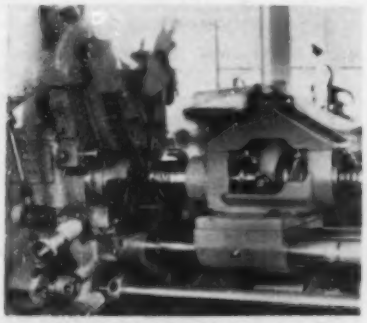
1961
TOOL SHOW IN PRINT

German-Made Facing Lathe Has Up to 70-Inch Swing in Gap

The Ravensburg KD-45 facing lathe, made in Germany, swings up to 70 in. in the gap, and can be furnished with a sliding bed to accommodate a tailstock for between - centers work. The horsepower input is relatively low in these models, since the very nature of the workpieces calls for low speeds and feed rates.

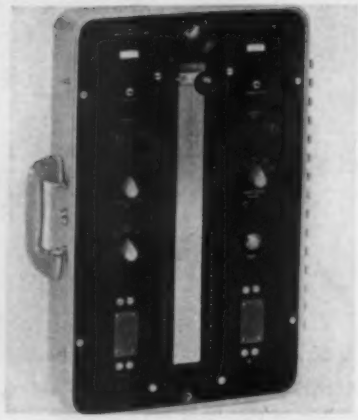
Dist by Rudel Machinery Co, Inc, 109 E 42nd St, New York 17, NY

MORE DATA? Circle 187, inside back cover



OPPOSED SPINDLE ATTACHMENT is used for cutting off without a burr. This opposed spindle rotates in same direction and at same spindle speed as headstock spindle and part is being held at both ends during cutoff. Therefore, tool can go past center without part breaking off; thus, burr is eliminated. Also on display will be a hydraulic tracing attachment. — *Traub USA, Inc, 38-31 Crescent St, LI City 1, NY*

MORE DATA? Circle 188, inside back cover



Transistorized Cable Analyzer Checks 75 Circuits in Two Sec

The Mark-75 — a newly developed and patented cable analyzer that is portable and transistorized — will double-test 75 different circuits in two seconds. It checks for continuity, cold soldered or improperly crimped wire points, faulty plugs or connectors, and short circuits.

In addition, it simultaneously tests for leakage resistance from any one conductor to all others electrically shorted together and grounded.

A wide range of go and no-go limits in leakage resistance and conductor circuit resistance can be selected on the instrument which has a mechanical interlock to prevent inadvertently making an incomplete test.

MicroBalancing, Inc, Herricks Rd, Garden City Park, LI, NY

MORE DATA? Circle 189, inside back cover

Self-Contained Hole Puncher Makes Holes to 3½-in. Dia

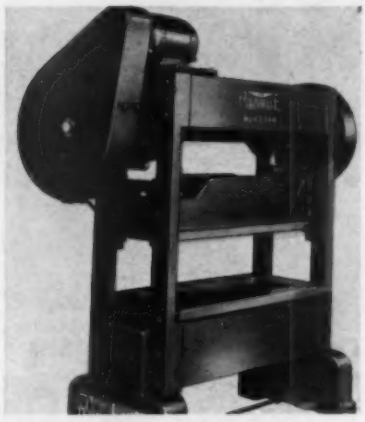
The BN series, the latest addition to the company's line of self-contained hole punching units, is designed for punching round and shaped holes up to 3½-in. dia in material up to 10 gage. They are made for use without a guide button.

With this feature, only a punch and die (round or shaped) are required when changing from one hole size to another. For optimum hole quality, however, the option of using a fitted or closed guide is still available.

The new design, which retains the advantages and strength of one-piece construction, permits easy removal and rotation of the die without removing the holder from the setup.

Wales Strippit Inc, Akron, NY

MORE DATA? Circle 190, inside back cover



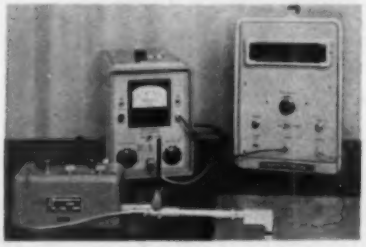
40-Ton Straight Side Press Has Bed Area up to 6 Feet

This 40-ton straight side press is furnished with bed areas up to six feet and die spaces up to 24 in. The press has a rigid four-corner ramp support that allows handling of wide rolls or sheets of leather, plastics, paper, or sheet metal at top speed. Speed is said to be even greater when press is equipped with Econo - Air clutch and brake which retails for $395 complete.

The press line comes in 5 to 60 ton sizes in a wide range of types and models.

Service Machine Co, Inc, 2310 W 78th St, Chicago 20, Ill

MORE DATA? Circle 191, inside back cover



Counter Determines Number of Peaks Higher Than Preset Limit

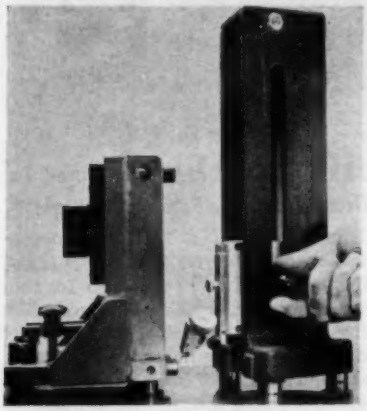
This new profilometer peak counter combination provides a means for counting the number of peaks mak-

ing up the average reading on the profilometer meter. The working combination consists of a profilometer amplimeter, mechanical pilotor, tracer and peak counter.

The stroke can be any desired length within the limits of the Pilotor and the average microinch reading can be read directly from the profilometer amplimeter simultaneously with the reading of the peak counter.

Micrometrical Manufacturing Co, 345 S Main St, Ann Arbor, Mich

MORE DATA? Circle 192, inside back cover



Straightness or Squareness of Tools, Slots Shown By Indicator

The Indi-Square instrument reportedly shows squareness or straightness of workpieces as close as 0.0001 in. in 16 in. For measuring, the instrument is positioned to the work and the indicating head is raised or lowered. Squareness and straightness are read on the indicator.

The head is spring-loaded to eliminate shake and rides on a master bar that can be adjusted from front to back in seconds. An accessory granite plate is available for calibrating the instrument and, once calibrated, the unit is said to remain accurate unless abused.

The Indi-Square Co, 1119 East Ridge Rd, Rochester 21, NY

MORE DATA? Circle 193, inside back cover

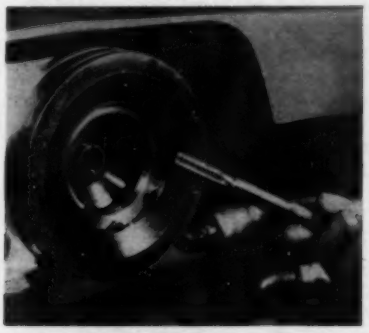
Crucible Steel Designed for Plastic Molds, Die Casting Dies

Prehardened CSM 2 has a minimum hardness gradient between surface and center of the block. This means that there will be higher hardness in the center of large molds and dies, it will have smooth machining characteristics throughout, and there will be greater resistance to wash at bottom of cavity. It is specially recommended for plastic molds and die casting dies.

Because of its smaller hardness gradient from surface to center, more uniform finishes can be obtained from top to bottom.

Crucible Steel Co of America, Four Gateway Center, Pittsburgh 22, Pa

MORE DATA? Circle 194, inside back cover



ACCESSORY FOR MODEL 100-A drill pointer grinds chamfers on taps. With the new workhead, a grinding rate of 12 taps per min is claimed by manufacturer. Angle of chamfer grind is determined by angle formed on wheel, and precision because of this is claimed to allow user to produce tapped holes to Class 5 precision—*Winslow Product Engrg Corp, 47 St Joseph St, Arcadia, Calif*

MORE DATA? Circle 195, inside back cover

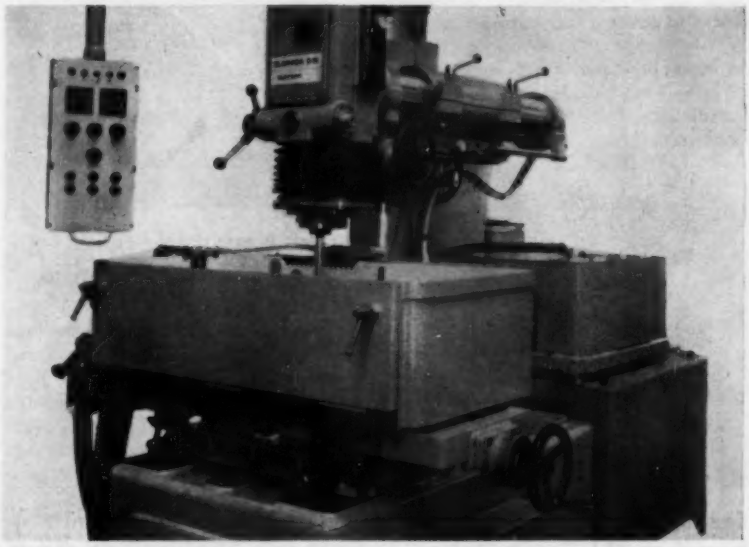
Torrington Rotary Swager Puts Sharp Shoulder on ⅛-in. Stock

The new Torrington 111 DC rotary swaging machine forms sharp shoulders on workpieces with the closing action of the swinging dies. Parts are inserted into the open dies with the machine running and pulled from the machine when the dies have closed. This produces a sharp shoulder on the swaged part where the diameters change.

Solid stock, ⅛ in. and under, can be swaged with this model; other models are available for larger stock.

The Torrington Co, 59 Field St, Torrington, Conn

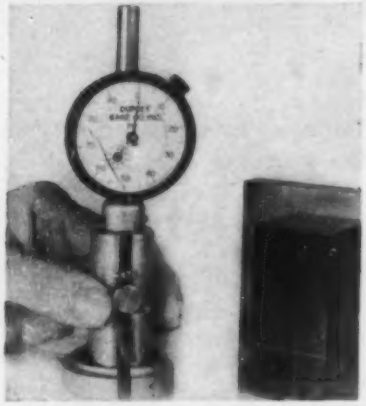
MORE DATA? Circle 196, inside back cover



ELERODA D15 ELECTRICAL DISCHARGE MACHINE, made with building block design, has a high speed metal removal rate of 15 cu in. per hr. Space between table and electrode holder can be varied between 11 and 29 in. Standard machine has 32 x 12-in. work table; in addition, it can be supplied with a steady worktable 49 x 39 in., or with 24 x 15.5-in. coordinated table equipped with optical reading—*Charmilles Engrg Works Ltd, 25-20 43rd Ave, LI City 1, NY*

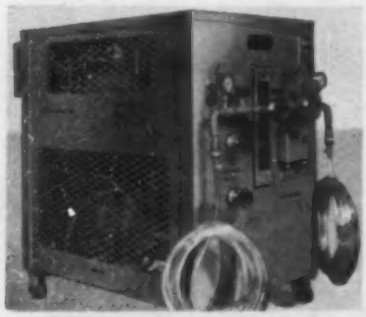
MORE DATA? Circle 197, inside back cover

1961
TOOL SHOW IN PRINT



SCRIBE GAGE, a simple, easy-to-set device said to be the only one of its type on the market, is one of a wide line of gages being shown. Principle in this gage is to use an 0.001 indicator to set scribing mechanism in a matter of seconds. Inexpensive, the gage comes with various size riser blocks to cover a large range beyond its 1-in. range. Other gages, based on same principle, cover as much as 12 in. in range—*Dorsey Gage Co, Inc, Dorsey Lane, Hyde Park, NY*

MORE DATA? Circle 198, inside back cover



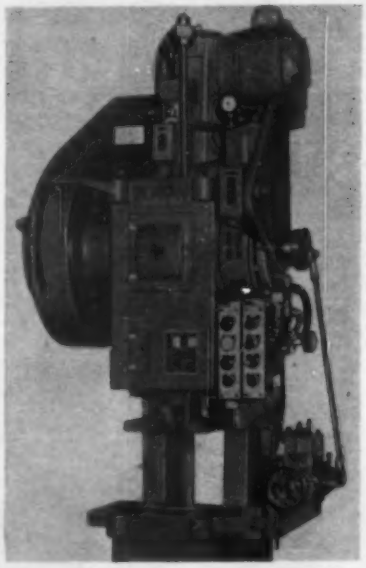
Control System Holds Selected Temp to ± 2° for any Period

This portable temperature control system—designed for delicate electronic instruments, sensitive mechanisms, or temperature-critical chemicals, baths, or compounds—can maintain a selected temperature level ± 2° for any desired period, according to the manufacturer. This is done with a standard Frostrode, Freon 12 liquid cooling system and an immersion-type liquid heating unit coupled by a sensitive, two-stage thermostatic control with a single knob selector. Remote control is available if desired.

The unit has an adjustable flow rate of 0 to 5 gal per min of desired type liquid, and maintains dependably accurate temperature regulation at less than half the cost of previous methods, the company claims. Parts for the caster-mounted system are standard and available from stock.

Frostrode Div of Progressive Welder and Machine Co, 915 Oakland, Pontiac, Mich

MORE DATA? Circle 199, inside back cover



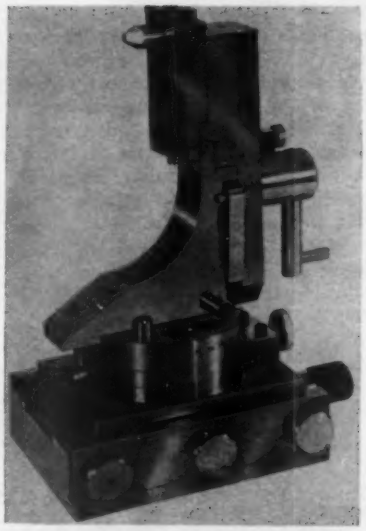
Perkins Presses' Low Center Of Gravity Minimize Vibrations

Series S presses have extra low centers of gravity and therefore permit fast operation with minimum vibration. Eight stroke lengths are possible with the adjustable stroke crankshaft and a self locking ram adjustment which may be motorized is said to save on machine downtime.

Other features are a counterbalanced ram, wheel mounting left or right, speeds to 600 rpm, long bronze gibways and automatic lubrication, with recirculation optional at extra cost. The presses are made in 15 to 150 ton sizes.

Perkins Machine Co, Warren, Mass

MORE DATA? Circle 200, inside back cover



J&S Diamond Dresser Designed To Dress Internal, External Wheels

This Model RFG 650A diamond wheel dresser has adjustable diamond height and two holders for the diamonds. It is primarily intended for universal grinders where the dresser has to be mounted on a solid angle ramp and both the external and internal grinding wheels must be dressed. 12 in. dia wheels are recommended as a maximum.

For controlled infeed of the diamond on surface grinders, the dresser has a romovable micrometer base.

J & S Tool Co, Inc, 87 Dorsa Ave, Livington, NJ

MORE DATA? Circle 201, inside back cover

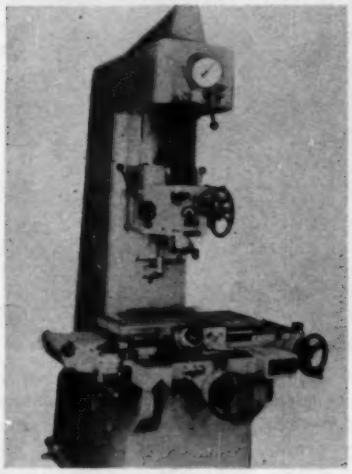
Tooling for Automatics Cuts Changeover Downtime by 50%

Newly developed quick-set tooling for single spindle automatic chuckers is said to slash machine downtime for job changeovers 50 to 75%, and therefore to justify smaller runs. Tools are preset (away from ma-

chine) from base lines established and shown on layout drawings. They are then hydraulically clamped in machine for fast, easy tool changes.

Scully-Jones and Co, 1901 S Rockwell St, Chicago 8, Ill

MORE DATA? Circle 202, inside back cover



Manex Optical Jig Borer Also Does Jig Grinding

Capable of doing both boring and grinding without resetting of the workpiece, this two-in-one machine from Europe features automatic reciprocation of the spindle and table. The illustration shows the unit set up as a jig borer, with total coincidence readers. An optional grinding attachment is available.

Clearance between spindle and table is said to be exceptionally high; this may be either 25½ or 31½ in.

Dist by Manex Machinery Corp, 204 Central Park S, New York 19, NY

MORE DATA? Circle 203, inside back cover

Segal Eyeleting Machine Limits Spindle Travel, Stops Deflection

Model TW automatic eyeleting machine feeds, sets, and resistance-fuses eyelets as small as 0.20 in. ID to boards as thin as 1/64 in. A spindle travel limiter prevents tool breakage if, when working with small eyelets, the spindle strikes the anvil pilot and starts to deflect.

Another feature of the machine, interlocking operation of the mechanical and electrical cycles, insures complete mechanical setting of the eyelet before the electrical fusing starts.

Mechanical dwell time and heat cycle are variable up to one second and arcing is eliminated by electrical interlocks. Stroke of the machine is 2 in., throat depth is 15 in., and timing transformer is rated at 5 kw, 25 amps, 220 volts ac.

Edward Segal 132 Lafayette St, New York 13, NY

MORE DATA? Circle 204, inside back cover

Tapping Fluid Protects Tools In Hard Metals With Chemical Film

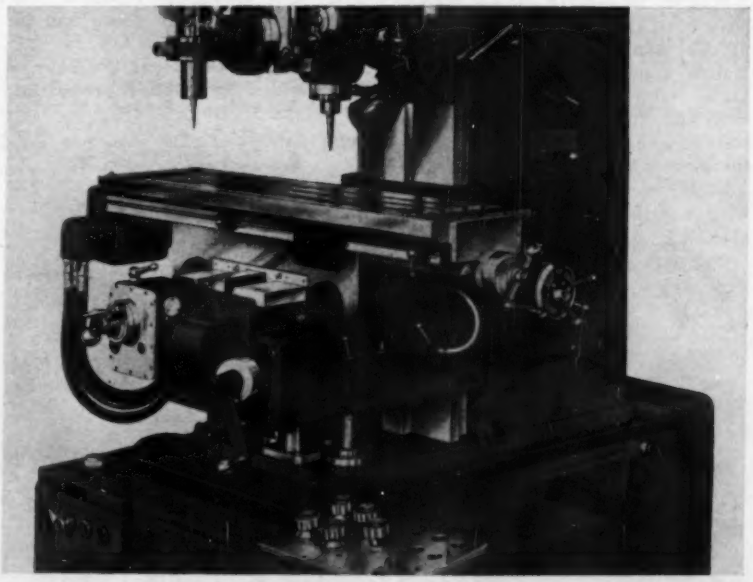
Especially compounded for tapping, drilling, reaming, boring, and finishing in hard metals such as stainless steel, Cuttap creates a chemical film between the tool face and the surface of the work. This film is said to reduce adhesion and surface tension and therefore reduce tap breakage and improve surface finish and thread accuracy. The fluid is available in amounts from 8 oz to 55 gal.

Canton Chemical Corp, Wilmington 99, Del

MORE DATA? Circle 205, inside back cover

UNIVERSAL STEEL WORKER, one of the Peddinghaus No. 210, size 16 models, is designed for manufacturing as well as experimental and maintenance work. Capacity: shears, 5½ x ¾-in. flats; bar cutter, 1⅞ in. rounds, 4 x 4 x ⅜ in. angles at 45°. It punches through ¾ in. plate and notches ½ in. plate—*Upton Bradeen & James Ltd, 890 Yonge St, Toronto 5, Ont*

MORE DATA? Circle 206, inside back cover



MODEL TM43A TRACEMASTER (Lapointe-Hayes), a fully automatic copy die sinking machine, will be in operation at Show. Other operating machines will be: Model BW 10 x 36-in. cylindrical grinder (Lapointe-Churchill); Model 10 B2 sliding, facing, and thread cutting lathe (Lapointe-Lang) with 24-in. swing, 60 in. between centers; Model 5B Sunderland gear planer (Lapointe Parkinson); Model 3DS ram-type turret lathe (Lapointe-Ward) with 2-in. capacity and air-operated bar feed and chuck—*Lapointe Machine Co, Hudson, Mass*

MORE DATA? Circle 207, inside back cover

1961
TOOL SHOW IN PRINT

Balcrank Displays Cone-Shaped Handles, Small-dia Hand Knobs

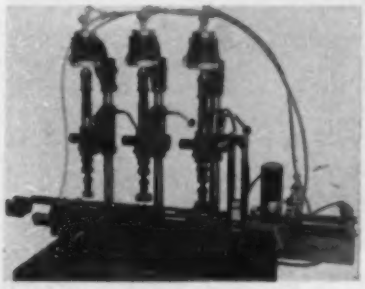
New conical-shaped handles, both revolving and solid, are available in three sizes with overall lengths from 3-1/16 in. to 4-11/16 in. All models have been standardized with a 7/16-in. dia shank for press-fitting.

Also shown are small-dia hand knobs which are machined from solid bar steel. They come in five sizes ranging from 1-in. to 3-in. dia complete with or without handle.

Both can be obtained from stock with a polished lustre or chrome plating.

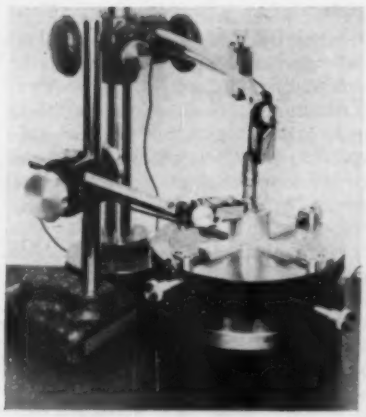
Balcrank Inc, Cincinnati 9, Ohio

MORE DATA? Circle 208, inside back cover



MARKING AND NUMBERING press operates on all kinds of nameplates in one operation. Machine can imprint many closely spaced lines—*Ameurope, Inc, 1199 Broadway, New York 1, NY*

MORE DATA? Circle 209, inside back cover



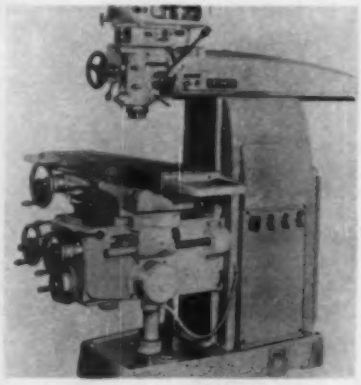
Cleveland Gage Now Features Turntable Tilt Adjustment

Because this Indi-Ron roundness, concentricity, and squareness gage now has a new turntable tilt adjustment, the operator can quickly adjust the workpiece position so that its axis coincides exactly with the ultra-precise spindle axis (accuracy reported at 0.000,001 in., both axial and radial).

The new component is controlled by two fine pitch screws working against specially designed wedge forms. Acting at 90° to each other, these adjustments are made in line with the centering controls and therefore, the whole setup can be made in two positions.

Cleveland Instrument Co, Subs of The Bendix Corp, 6220 E Schaaf Rd, Cleveland 31, Ohio

MORE DATA? Circle 210, inside back cover



Vertical Boring-Milling Unit Has Total of 24 Feeds

This European machine has 24 longitudinal, cross, and vertical power feeds. The vertical boring and milling unit also features rapid traverse in all directions.

Other specifications: table surface, 59 x 13 in.; swing of head, 180°; net weight, 5300 lb; price $7850.

Dist by Manex Machinery Corp, 204 Central Park S, New York 19, NY

MORE DATA? Circle 211, inside back cover

MODEL Y ELECTRIC FURNACE has a pneumatic lift system for the furnace door. Sentry diamond blocks are said to provide a positive protective atmosphere for high carbon, high chrome, and high speed steels. Tools can reportedly be "soaked" in this atmosphere without danger of surface deterioration — *The Sentry Co, Foxboro, Mass*

MORE DATA? Circle 212, inside back cover

German-Made Cutter-Grinder Sharpens Circular Knives

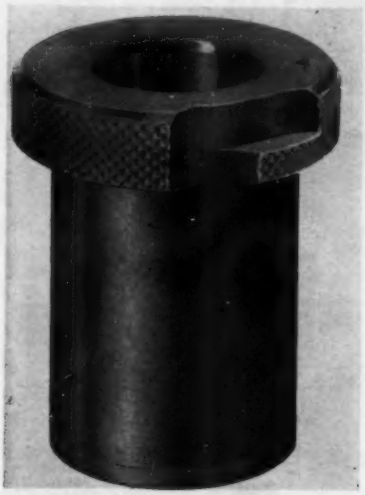
Suitable for grinding circular knives of all kinds, the Goeckel cutter-grinder is available in two types: R2P for wet grinding, R2 for dry. Maximum diameter that can be ground is 12 in. If necessary, provision can be made for larger dia.

Design of the machines permits use of both cup and plain cylindrical grinding wheels, so that all grinding effects, like radial or peripheral grinding, are possible. Normal accessories include a cup wheel, a cylindrical wheel, one set of guards, a set of tools, and one mandrel. Op-

tional equipment includes a device for wet grinding with electrical pump, a clock gage, permanent magnetic chuck, and three-jaw chuck.

Distributed by Mercuria Co, 3710 South Western, Chicago 9, Ill

MORE DATA? Circle 213, inside back cover



Drill Bushing Liners Twist to Lock, Are Held in by Drill Spin

Un-A-Lok liners eliminate the need for a lock screw formerly required to secure slip-renewable type drill bushings in place. The liners are provided with ground or unground outside diameters, or may be ordered with Delt-A-Liner outside diameters for plastic tooling. A twist of the bushing locks it into the liner and a reverse twist unlocks it. During operation, bushing is locked in by the rotation of the drill.

American Drill Bushing Co, 5107 Pacific Blvd, Los Angeles 58, Calif

MORE DATA? Circle 214, inside back cover

UNIVERSAL LATHE SPINDLE and collet stop is designed for all lathes, turret lathes, and screw machines. The accessory is fully adjustable, comes in sizes from ¾ in to 3½ in., and is completely self centering—*Aloris Tool Co, Clifton, NJ*

MORE DATA? Circle 215, inside back cover

Custanite One-Quart Lubricator Clamps to ¾-in. Drillpresses

This drillpress lubricator, known as Custamist, fits the column of a standard ¾-in. drillpress and can be rotated 360 deg around the column to find the best working position. A special two-valve system controls fluid and air, which are fed to the tool via metal-mesh-covered nylon lines with 8-in. gooseneck tips.

Custanite Corp, 1228 Utica Ave, Brooklyn 3, NY

MORE DATA? Circle 216, inside back cover

Bentley Shows Repetition Lathe, Tool and Die Surface Grinder

Two machines being displayed by the company are the Abwood SG4H precision tool and die surface grinding machine, and the Britan repetition lathe in ¾ and 1¼-in. collet capacity.

The grinder is designed specifically for the high production of really flat surfaces to close limits at high rates with fine finishes. According to the company, they guarantee flatness of work, with production sizing to 0.0002 in. Table traverse is completely shockless and is operated by a double-acting hydraulic piston. Extremely fine and sensitive controls give a range of 0 to 30 fpm.

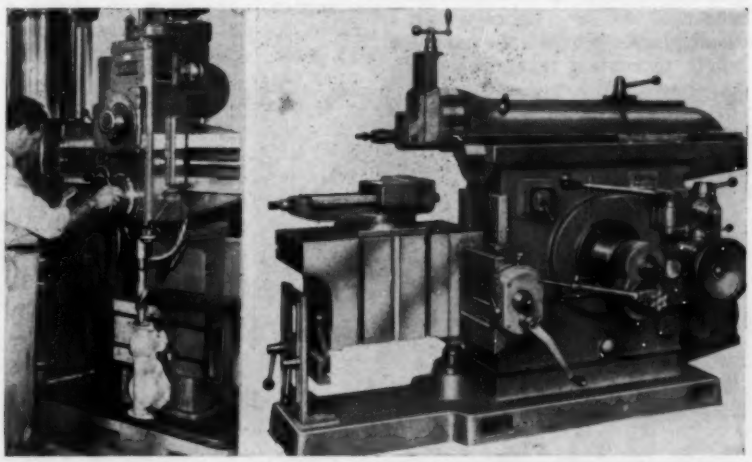
The Britan lathe (made in England) uses up to 15 tools at one setting. And the machine will, with unskilled operators, readily produce repetition parts to fine, consistent accuracy, according to company.

Bentley Industrial Corp, 21-19 46th Ave, Long Island City 1, NY

MORE DATA? Circle 217, inside back cover

NEW TOP PLATE for Ceramax Chucks has gap divisions reduced to 1/16-in. stainless. Holding power for large workpieces is maintained by retaining ¼-in. poles, while adding intermediary ⅛-in. poles lets chuck hold securely thin work and pieces as small as ⅛-in. dia. New plate comes in sizes 4 x 4 through 6 x 18 in.—*O S Walker Co, Worcester, Mass*

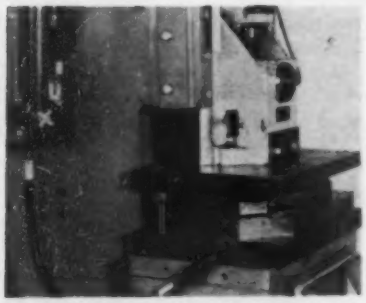
MORE DATA? Circle 218, inside back cover



IMPERIAL MODEL M4PE RADIAL DRILL (L) and Excelsior single pulley shaper Model 625 (R) are two machines being shown. The shaper has forced feed lubrication, a swiveling table, and a 19 11/16-in. stroke of ram. Other machines being shown are Pedersen vertical and horizontal milling machines in 10 models, and Imperial sliding-bed gap lathe and Multi-Matic No. 10 ironworker—*Dist by Aaron Machinery Co Inc, 45 Crosby St, New York 12, NY*

MORE DATA? Circle 219, inside back cover

1961
TOOL SHOW IN PRINT



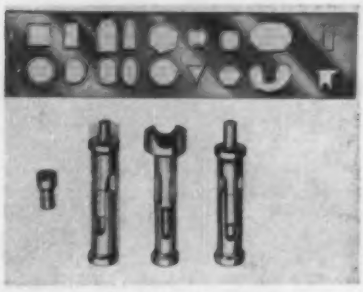
System Changes Die Pad Pressure At Any Time During Press Stroke

New control valve—which controls hydraulic pressure to die pads—will now enable the application of a pressure which subsequently may be varied up or down at a predetermined time of the press stroke. It therefore makes possible controlled slippage or rigid holding, as required, of stock passing through the die.

The company is also showing a new telescoping piston-cylinder assembly for use in dies with inadequate thickness of shoe or punch holder. A sliding cylinder within a fixed cylinder provides the extended length to contain the piston to its full length.

Die-Draulic Grip, Inc, 1440 Front Ave, NW, Grand Rapids 4, Mich

MORE DATA? Circle 220, inside back cover



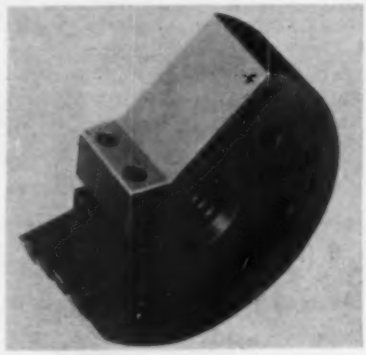
Porter Precision Products Has Durable Intermeshing Sleeves

Durable intermeshing sleeves, a part of the sleeve support line, will be shown along with the company's rod piercing sleeves. These are said to open new areas in stamping operations, and to add greatly to trouble-free performance in piercing dies.

Also on display will be what is called a totally new concept in piercing combinations. This will feature the perforating set which includes a nib-type perforator, quill-type punch holder, stripper guide bushing, and matching die button. These sets take advantage of line boring techniques for punch pad, stripper pads, and die sections.

Durable Punch and Die Co, Subs of Porter Precision Products, P O Box 208, Cincinnati 15, Ohio

MORE DATA? Circle 221, inside back cover



COMPOUND - RELIEVED CIRCULAR form tool, with clamped-unit design, is available for 5 to 6-day delivery. These precision-ground inserts—made in carbide, Vasco-Supreme, Tantung, or 18-4-1—are offered with side clearance for jobs where conventional dish clearance is not adequate.—*Arthur A Crafts Co, Inc 603 Newbury St, Boston 15, Mass*

MORE DATA? Circle 222, inside back cover

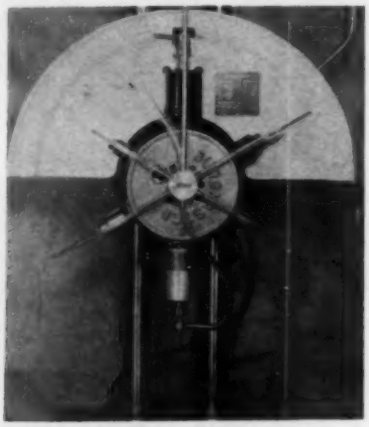
Airetool Pneumatic Roller Expands 30 Tubes per Minute

Model 400-TR tube expander, equipped with pneumatic motor, is specially designed for expanding both ferrous and non-ferrous tubes from ¼ to ⅜-in. dia. Expanding 30 or more tubes per min with the tool is reported not unusual by the manufacturer.

Weighing only 2¾ lb, the motor is hand held and run constantly with trigger control for instant forward and reverse operation, giving the operator control at all times. Because the new motor is available for 1700 or 2400 rpm operation, it is claimed to be able to expand tubes faster than any other previous method ever used for small tubes.

The Airetool Mfg Co, Springfield, Ohio

MORE DATA? Circle 223, inside back cover

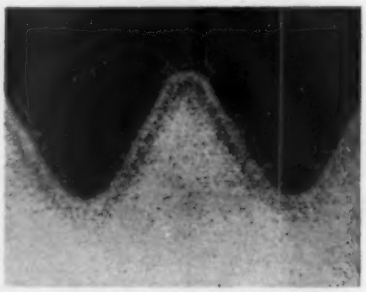


Lubricated Air Fed Directly To Tool Edges By Coolant Transfer

Coolant transfer for the Burgmaster turret drill is equipped with Perma-Fog air line lubricator (quart size) that enables an operator to apply lubricated air directly to the cutting edges of a tool and eliminates the necessity of a coolant pump. Coolant flows only when the tool is in operation and the flow may be regulated by a valve in the Perma-Fog unit. Price of the bench model is $185.00.

Skilcraft Corp, Ashby, Mass

MORE DATA? Circle 224, inside back cover



Thread Plug Gage Has Finished Surfaces Hardened to Rh 60 C

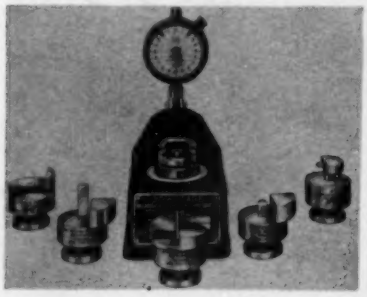
The Ala-Hide thread plug gage, made by a new process said to give wearing qualities approaching those of carbide but without carbide's

limitations, has full hardness penetrating evenly about the thread form to a depth of about 0.003 in. (see photomicrograph, above). Lower concentration over an extra 0.004 to 0.005 in. is said to insure a hard thread structure that is very strong.

The gage is said to have very great wear life without the brittleness, chipping, or peeling often found in other methods of hard surfacing gages. The new process, which raises gaging surfaces to Rh 72 C, can be applied to threads of all pitches and of very small diameter.

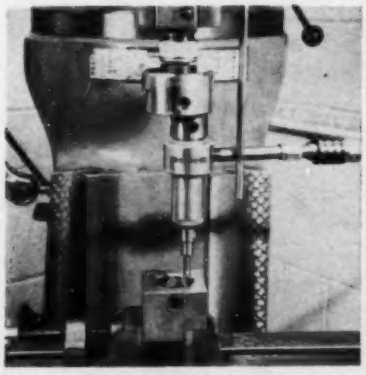
Alameda Gage Co, 10851 Capital Ave, Oak Park (Detroit), Mich

MORE DATA? Circle 225, inside back cover



EDUCATED FLUSH PINS check true position of various holes in relation to given surface. Checking speeds reach rate of 300 to 400 per hr, with accuracies as low as ±0.0002 in.—*The Dow Mechanical Corp, Thompsonville, Conn*

MORE DATA? Circle 226, inside back cover



Pneumatic Hole Grinder Has 0.0005-in. Runout, 30,000 rpm

This Dotco pneumatic hole grinder, available in 25,000 and 30,000 rpm models, comes in sizes to fit into boring heads having ½, ⅝, or ¾-in. chuck capacity. When inserted in a boring head and used in a vertical or horizontal mill, boring machine, lathe, or jig borer, the grinder provides a way to jig grind holes or male cylindrical members to precision tolerances.

The setup is similar to that of other offset boring work: the grinder is simply substituted for the boring bar. The 4-blade rotary vane-type pneumatic motor has precision ball bearings, interchangeable collets, and 0.0005-in. max spindle runout.

Doeden Tool Corp, Ohio Rt 18 East, Hicksville, Ohio

MORE DATA? Circle 227, inside back cover

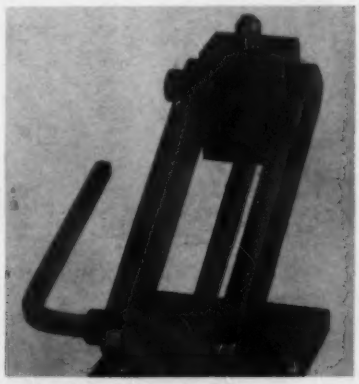
Crodian Air Chucks Hold Tight Tolerances

Precision air chucking, both internally and externally, is possible with the Stace air chuck. Rotating the air cap 180° permits either internal or external chucking. Maker claims this feature is especially useful in small shops where a machine must produce high precision on a wide range of parts.

Chucks are guaranteed to hold tolerances with 0.0005 in. tir. Other features: built-in air cylinder, replaceable jaws, controlled clamping pressure. Coolant manifolded through the chuck is available optionally.

Crodian & Co, 4897 Kessler Blvd & East Drive, Indianapolis 20, Ind

MORE DATA? Circle 228, inside back cover



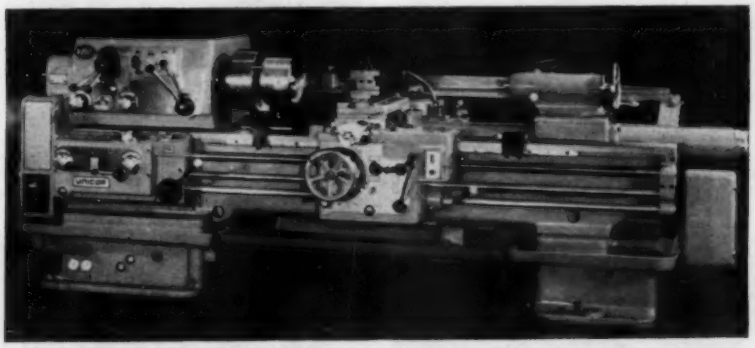
Adjustable Wheel Dresser Ends Bringing Wheel Down to Diamond

The Hi-Lo adjustable wheel dresser eliminates bringing the wheel down to the diamond, therefore saving time and machine wear. It is adjustable from 2⅞ to 8 in. above magnetic chuck or table of machine.

Because the dresser has three supporting arms, the company claims that it has an advantage over similar dressers. The three arms give rigidity and always keep diamond in proper position without using a C-clamp.

Eastern Machine & Tool Co, 170 Broadway, New York 38, NY

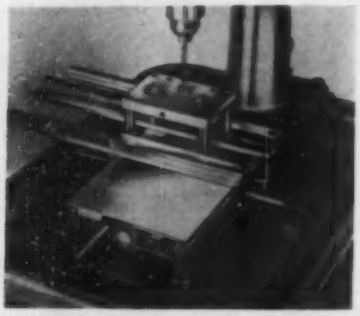
MORE DATA? Circle 229, inside back cover



UNICOP TYPE I TRACER LATHE, Model S-500 x 60 in., swings 20½ in. over bed and takes 60 in. between centers. The German-made machine has 30 spindle speeds, hardened and ground bedways, camlock spindle nose. Tracing is accomplished by sensitive electric stylus which, in turn, controls valves which control hydraulic fluid for both longitudinal and transverse movements of carriage. Machine will trace from either templet or model—*Dist by Rudel Machinery Co, 100 E 42nd St, New York 17, NY*

MORE DATA? Circle 230, inside back cover

1961 TOOL SHOW IN PRINT



Holder Gives Freedom of Motion Yet Always Holds Work Secure

The Slide Lox—which gives freedom of workpiece motion in any direction and at the same time insures that it is securely locked against turning or lifting— comes in vise or fixture-base model (shown). Two sizes are available in both aluminum and semi-steel; one is 6 x 9½ in., the other is 8 x 10 in.

Because all parts for the fixture are manufactured to interchangeable tolerances, additional bases only can be purchased. Manufacturer recommends it as a base for drill jigs both permanent or attached.

Lassy Tool Co, Plainville, Conn

MORE DATA? Circle 231, inside back cover

ROTARY OIL-COOLED industrial air compressors, suitable for any 100 to 125-lb plant air requirement, range in size from 2 to 125 hp. This gives actual delivery rates of 8 to 580 cfm— *Davey Compressor, 600 Franklin Ave, Kent, Ohio*

MORE DATA? Circle 232, inside back cover

Finishing Machine Has Two Spindle Indexing Workholder

This new finishing machine—designed for high production deburring, edge blending, surface cleaning, polishing, and buffing applications—consists of a two spindle indexing workholder and one universal finishing wheel head. The 5224-M1A, as it is called, is said to be ideal for continuous production runs.

The two spindle workholder allows inexpensive fixturing, while the M1A head is engineered for extreme versatility. During high production runs, the operator performs the unload and load operation on one spindle, while the gear or part on the other spindle is being deburred or finished.

Osborn Mfg Co, 5401 Hamilton Ave, Cleveland, Ohio

MORE DATA? Circle 233, inside back cover

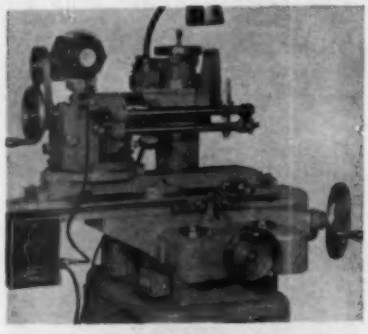
Precision Height Gage Said To Give Accuracy to ±0.0005 In.

The Micro-Height gage, available in two models, reads directly from zero at the base and eliminates vernier adding and subtracting. The thousandths scale is machine-cut in gradations of 0.100 in. on barrel, 0.001 in. on head; accuracy is reported at ± 0.0005 in. by the company. The bronze nut, which travels on a precision ground leadscrew, has a simple adjustment to calibrate or compensate for wear.

Model 2, with direct capacity of 3 in. and up to 9 in. with riser, sells for $53; Model 4, direct to 5 in. and up to 11 in. with riser, sells for $73.50. Prices include carbide scriber, indicator holder, and case.

Montgomery & Co Inc, 401 Morris Ave, Springfield, NJ

MORE DATA? Circle 234, inside back cover

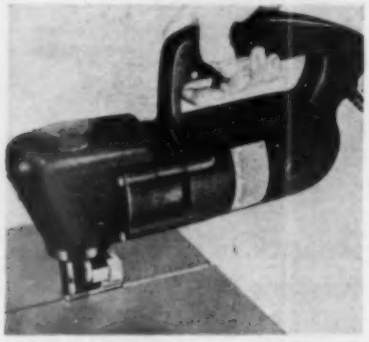


Boggis 2-Way Relieving Fixture Produces Axial, Radial Relief

The new Hybco Model 2100 two-way relieving fixture (shown mounted on company's Model 1900 grinder) will produce both axial and radial relief either in conjunction one with the other, or independent of each other. Special adjustments provide a variable amount of relief from zero up to the maximum, and the exact amount of relief desired can be preset and measured.

Henry P Boggis Co, 706 E 163rd St, Cleveland 10, Ohio

MORE DATA? Circle 235, inside back cover

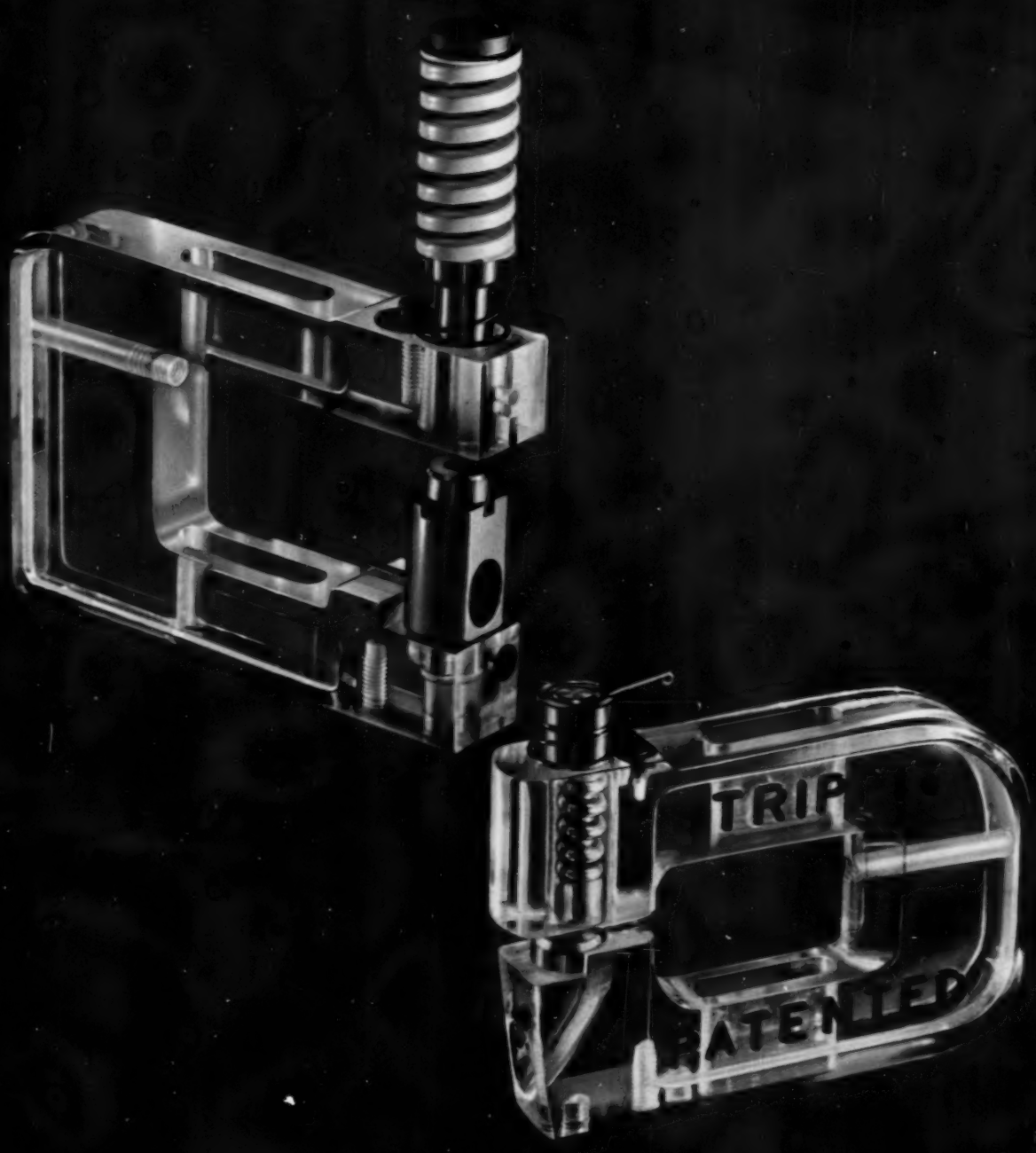


NIBBLER CUTS ¼ in. in stainless and 5/16 in. in mild steel. Weight of the machine, which is trademarked the Modern Gobbler, is 22 lb — *Modern Mfg Co, Inc, 680 Davisville Rd, Willow Grove, Pa*

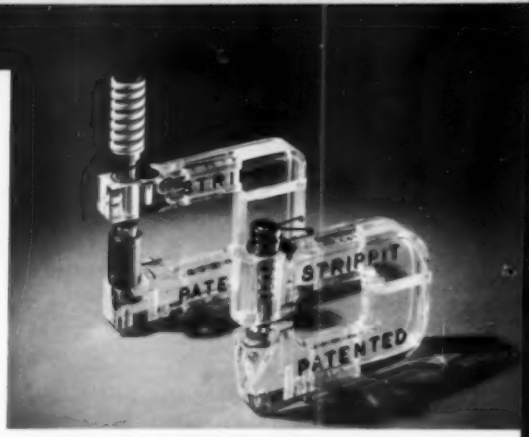
MORE DATA? Circle 236, inside back cover

(continued on page 248)

CIRCLE 351 READER SERVICE CARD ►



Get the inside story on cost saving STRIPPIT hole-punching units at the tool show-booth 1305



STRIPPIT bares all at the Tool Show. In addition to these transparent plexiglass holders that show exactly how STRIPPIT "BN" and "CJ" self-contained hole punching units are put together, you'll see actual demonstrations of STRIPPIT machinery in action and a display of all the other cost-cutting STRIPPIT sheet metal hole punching and notching units.

STRIPPIT Super 30 Fabricator punches round and shaped holes in workpieces 60" wide—any length. This amazingly versatile machine will also punch close-centered hole clusters in any material up to ¼" thick . . . notch and nibble square or contour cutouts in ⅛" material. Standard and special tools interchange in seconds. The Super 30 also features an indexed tool holder, micrometric gaging and an adjustable work table.

Stop at booth 1305 for positive proof that STRIPPIT cuts costs

STRIPPIT 15-A Fabricator saves you days or even weeks of time by eliminating tool designing and die-making. A new unique micrometric gaging system enables you to punch complicated patterns of round and shaped holes directly on this machine . . . to exact layout specifications . . . in minutes. The STRIPPIT 15-A also notches and nibbles sheet material.

STRIPPIT Duplicator functions like a pantograph to reproduce any hole pattern from a drilled or punched template. No custom dies are needed to turn out precision sheet metal parts in volume. The STRIPPIT Duplicator is a valuable accessory for both the Super 30 and 15-A Fabricators.

WALES **STRIPPIT** INC.

UNIT OF HOUDAILLE INDUSTRIES INC.

Buell Road • Akron, New York

In Canada: Strippit Tool & Machine Company, Brampton, Ont.; In Continental Europe: Raskin, S. A., Lausanne, Switzerland; In the British Isles: E. H. Jones (Machine Tools) Ltd., Hove, Sussex, England.

STRIPPIT Flex-O-Drill drills, reams, center punches and scribes with tool room accuracy . . . ±.002". By eliminating the need for base line drawings and vernier height gages, the Flex-O-Drill can reduce template making time 50% or more. Want an accurate machine for checking drawings, patterns, templates or production pieces? A new, inexpensive accessory converts the Flex-O-Drill to this dual purpose.

VISIT OUR BOOTH '61 ASTME TOOL EXPOSITION

Single-Point Thread Chasing—III

Warren G Ogden, Jr, manufacturing feasibility engineer, Raytheon Mfg Co, Lowell, Mass

As stated in the previous installment (AM/MM—May 1 '61, p97), a toolmaker must know how much to truncate a toolbit when he prepares to chase a thread. In the case of an internal thread, he must also know the diameter of the hole to be bored before threading.

The sketch below is based on thread data in Table 111.1 of Handbook H 28 (1957)—Part I, as published by the U S Government. This sketch and the table on page 191 are based on the design-size profile, when the screw and nut have one identical pitch diameter, or metal-to-metal fit. The "Ogden's value" is the calculated root diameter established by an unworn tool.

The table on page 191 gives seven columns of data. These enable the toolmaker to find size to bore the hole, the depth of toolbit truncation for an unworn tool, the infeed at 90° and at 29°. The table also gives the infeed at 90° and 29° when the toolbit is not truncated.

Example: to chase a 2½—4 UNC internal thread
To find:

a—truncation for unworn tool
b—truncation for worn tool
D_a—infeed, at 90° for unworn tool
D_b—infeed, at 90° for worn tool
Bore size of nut

Solution:

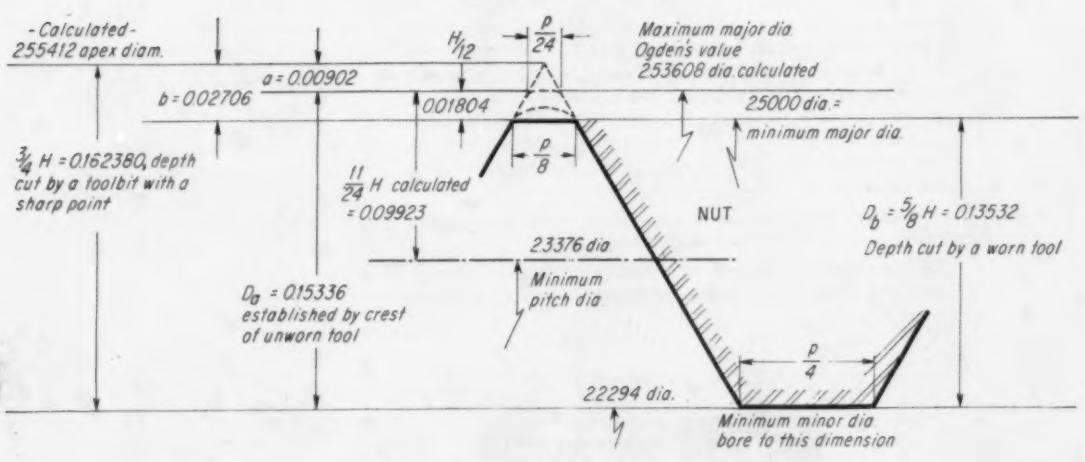
$a = 0.00902$, col 5 of table. Truncation a also equals $H/8 - H/12 = H/24$, where $H = 0.216506$ for $n = 4$. Also $H = 0.866025p$, where $p = 1/n$.

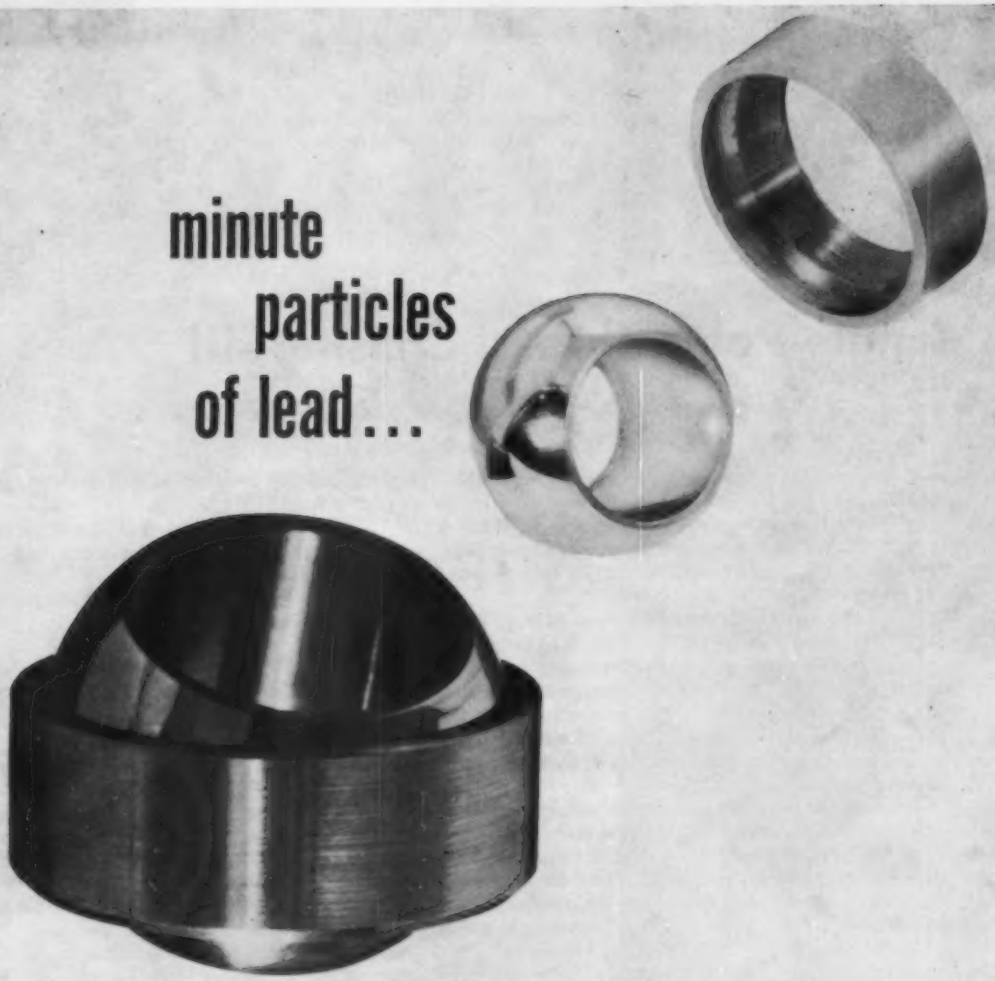
$b = H/8 = 0.02706$
$D_a = 0.15336$, col 3 of table $= 17/24\ H$
$D_b = \frac{5}{8}H = 0.13532$

Bore size of nut = minimum major dia minus twice the height of design-size thread = 2.500 — $2D_b$ = 2.2294. Or bore size = 2.500 — 0.27063 (Col 2 of table) = 2.2294.

Infeed at 90° for a sharp V thread is 0.16238, Col 7 in table, or ¾ *H*.

INTERNAL THREAD





minute particles of lead...

improve surface finish

On these center aligning balls used in automotive universal joints, CHARLESTON METAL PRODUCTS switched from A.I.S.I. 52100 to the same grade of steel *leaded.** They now report improved surface finish . . . a 15% increase in tool life . . . more uniform tolerances in finished parts. They also note that wear and shock resistance are not affected and uniform high hardness (RC 62-63) is maintained. Distortion remains at a minimum.

Results like these are not at all unusual when users switch to free-machining Aristoloy lead-treated steels.

For complete information about Aristoloy *electric furnace* bars and billets—call your local Copperweld representative or write today.

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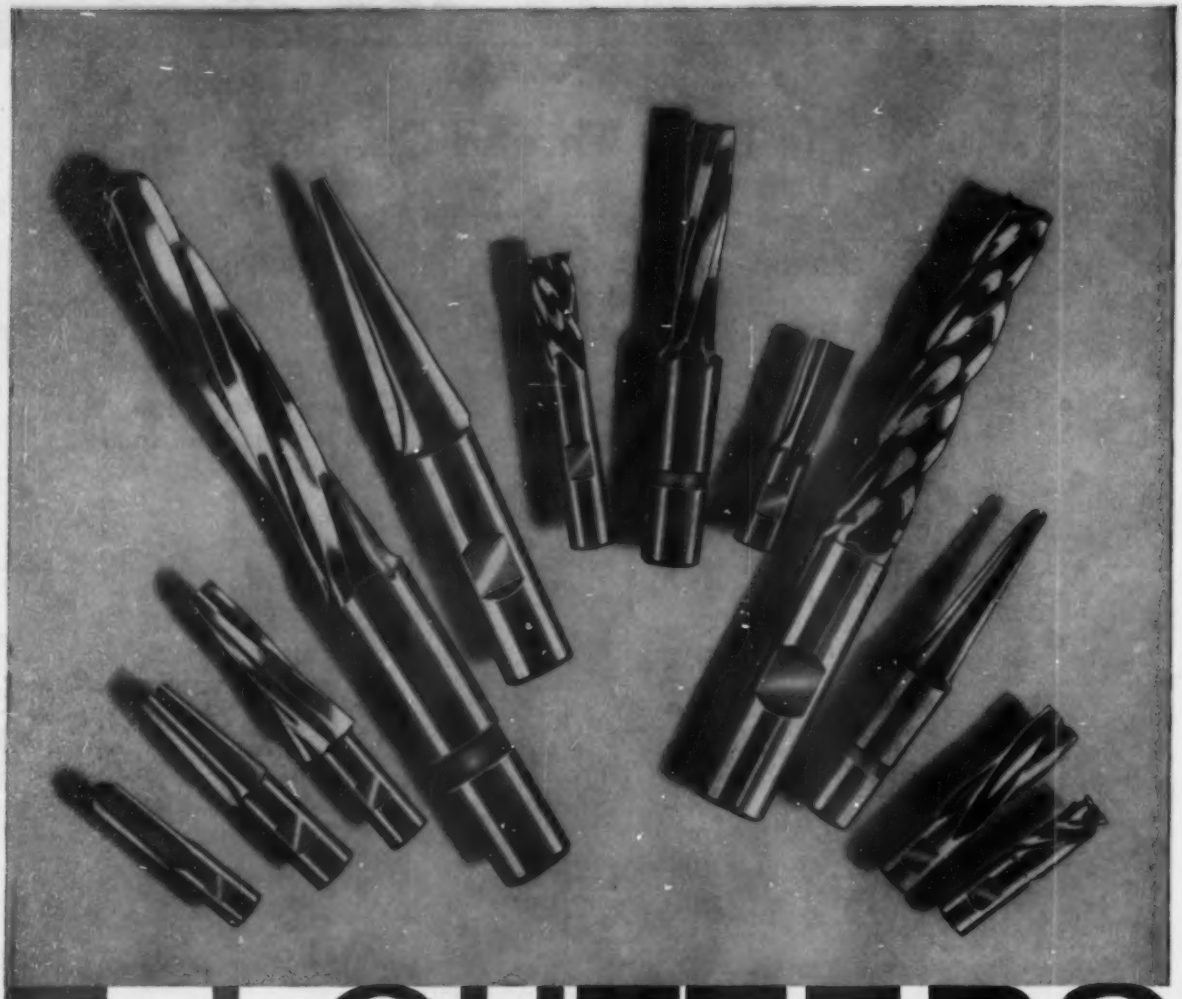
Single-Point Thread Chasing—IV

THREADS PER INCH n	SINGLE POINT THREAD CHASING IN A TOOLROOM LATHE INTERNAL THREADS ONLY UNIFIED THREAD FORM: CONSTANT to determine bore diam. before threading	INFEED at 90° to the MAXIMUM MAJOR DIAM.	INFEED at 29° to the MAXIMUM MAJOR DIAM.	DEPTH of TOOLBIT TRUNCATION	IF TOOLBIT IS NOT TRUNCATED Theoretical sharp point: INFEED at 90° to apex of fundamental triangle	INFEED at 29° to apex of fundamental triangle
	inch	inch	inch	inch	inch	inch
80	0.01353	0.00767	0.00877	0.00045	0.008119	0.00928
72	.01504	.00852	.00974	.00050	.009021	.01031
64	.01691	.00958	.01095	.00056	.010149	.01161
56	.01933	.01095	.01252	.00064	.011599	.01326
48	.02255	.01278	.91461	.00075	.013532	.01547
44	.02460	.01394	.01594	.00082	.014762	.01688
40	.02706	.01534	.01754	.00090	.016238	.01857
36	.03007	.01704	.01948	.00100	.018042	.02063
32	.03383	.01917	.02192	.00113	.020297	.02320
28	.03866	.02191	.02505	.00129	.023197	.02651
27	.04009	.02272	.02598	.00133	.024056	.02751
24	.04511	.02556	.02922	.00150	.027063	.03094
20	.05413	.03067	.03507	.00180	.032476	.03714
18	.06014	.03408	.03897	.00200	.036084	.04125
16	.06766	.03834	.04384	.00226	.040595	.04641
14	.07732	.04382	.05010	.00258	.046394	.05304
13	.08327	.04719	.05395	.00278	.049963	.05712
12	.09021	.05112	.05845	.00301	.054127	.06189
11½	.09413	.05334	.06099	.00314	.056480	.06458
11	.09841	.05577	.06376	.00328	.059047	.06752
10	.10825	.06134	.07013	.00361	.064952	.07426
9	.12028	.06816	.07793	.00401	.072169	.08252
8	.13532	.07668	.08767	.00451	.081190	.09283
7	.15465	.08763	.10019	.00515	.092788	.10609
6	.18042	.10224	.11690	.00601	.108253	.12377
5	.21651	.12269	.14028	.00722	.129904	.14852
4½	.24056	.13632	.15586	.00802	.144338	.16503
4	.27063	.15336	.17534	.00902	.162380	.18566

Subtract constant from major diameter of external thread.
If crest of tool is rounded it should be tangent to p/24 flat



T-J CUTTERS

Designed To Do *More* Jobs . . . Produce *More* Work . . . Save *More* Production Time and Cost

Proved, definitely, as the cutting tool for the die-sinking industry, T-J now offers an expanded cutter line for the precision milling of today's high speed, high production manufacturing. The new line has been designed to do more, as well as add to individual cutter life. Cutters feature a high helix angle, double back-off, right or left hand spiral, and flats on the shanks for set screw type chucks. Write today for Catalog No. 259 and complete details to The Tomkins-Johnson Co., 2425 W. Michigan Ave., Jackson, Mich.

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RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

Talking Shop

New Ideas

THERE IS A LOCK found in the ruins of a palace near Nineveh in Egypt that seems to have been in use about 4000 years ago. The lock worked on the same principle as the cylinder lock invented by Linus Yale in 1844. In between, many locking methods were devised and they all seem to be inferior to the original and final designs, which proves that the first idea is sometimes the best solution after all.

The fascinating discussion of locks that prompts all this is in the March issue of "Now my idea is," a pamphlet published periodically by Gisholt Machine Co. If you haven't seen it, circle item 50 on the Readers' Service Card and we'll ask Gisholt to send you a copy.

Giant Tracer

CONTOURED PARTS up to 12-ft dia are handled on a Niles 144-in. vertical boring mill at Kinco in Montebello, Calif. Contouring has been added by installing a Mimik 3000 series hydraulic tracer with an 8-in. tracing stroke. There is no limit placed on workpiece size by the tracer, since the stroke can be increased by engaging the machine feed along the mean path of the contour. The tracer can also be moved to a 100-in. mill in the plant when it is needed there.

Reliability at Buick

THERE ARE SAID to be 740 critical parts in a Buick and the aim of the reliability program there is to achieve 99.99% reliability on each of them, according to Edward Rollert, general manager of Buick. This is one of a number of reliability programs on commercial products and one of the few that has given even this much indication of the goals set.

One problem is that a reliability goal that is set at an impossibly high level may sound low to the consumer. We reported that each of the thousand parts in an Allison engine have to be 99.9995% reliable to achieve a 95% reliability of the engine. We won't embarrass Buick by computing what you get theoretically with their standards, because theirs is an impressive goal in our opinion. Rollert reports that since the reliability program started, infant mortality—the repairs required in the first few days of ownership—was reduced 50% between 1959 and 1960 models, and has been further cut on 1961 models.

"Light" Uranium

THE CONVAIR 990 is 65 lb lighter because of the use of uranium in control surfaces, despite the fact that uranium is 11% heavier than tungsten and 165% denser than lead. This paradox arises from the use of this heavy, radioactive material as a counterweight in the control surfaces. The use of denser material moves the center of gravity forward, increases the lever arm, and reduces the total weight required.

Uranium weights are cadmium plated to reduce oxidation and the spread of uranium contamination. The "depleted uranium" used, from which U-235 has been extracted, costs about the same as the tungsten it replaces.

Special Award

SOME SORT OF TROPHY should be presented to W W Walker of Air Reduction Sales Co. Our editors, who have gone through the scores of papers produced at annual and other recent technical society meetings, say he seems to be the only one who used the term "independent variable." In these parameter-happy days, he stands out with the clarity of a lightship.

What's so fascinating about the word parameter? Is it more precise than the term independent variable? Does it save time and space? It saves space, but probably costs time of the listener or reader who has to stop and translate.

We suspect it is part of the tendency to develop special terms to make work seem respectably complex to the layman. A *simple* oakleaf crown would seem an appropriate award to Walker.

Boom Sign

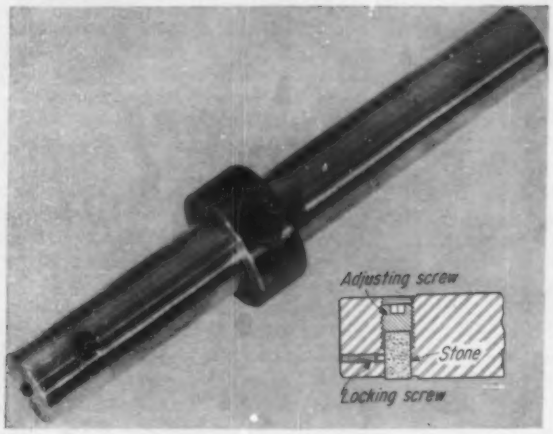
THE RECESSION is over if we can go by swizzle sticks. A Chicago firm, Cell-O-Core & Co, has just received an order for 13 tons of swizzle sticks from a Milwaukee firm. That adds up to ten million swizzle sticks and at highball rates means about $7 million dollars in current bar prices.

Space Correspondent

JUST TO SHOW that our correspondents learn their subjects the hard way (from the ground up?), here's a shot of Ted Schafers, our St Louis correspondent, curled up in a Project Mercury space capsule. This particular capsule is used at McDonnell Aircraft to test our astronauts on some of the complex instrumentation. See page 130 for Ted's report on the fabrication of the real thing. •

Practical Ideas

Hand Hone Removes Blemish of Alteration



Inserted in a honed hydraulic cylinder, this tool stones down and hones the end of a plug, blending it into the finished bore without marring the surrounding surface in any way.

This sums up the ultimate outcome of a situation that was created by a design change which required an existing ⅛-in. outlet to be plugged before a new location was drilled. The diameter of the bore we were working with was 0.750 in. and had been honed to a mirror finish. And, as the plugged area was within the travel of a plunger O-ring, all projections and burrs had to be removed and the finish duplicated on the plug while staying within a tolerance of ±0.0001 in.

Our first step was to machine a piece of brass bar to a slip fit in the bore and reduce the forward end of it to clear the plug. (We bored away the plug projection to within 0.002 in. before entering the hone.) A hole was next drilled diametrically through the bar, at the end of the reduced portion, to accept a ¼-in. India-oil stone. One end of the hole was tapped for an adjusting screw and a smaller hole was drilled and tapped from the end of the bar to take a locking screw. For depth control, a collar with a setscrew was provided.

After dressing the stone to merely touch the plug, while running the bar true in the lathe, the hone was inserted in the cylinder and rotated in forward and back strokes long enough for the stone to cover the plug. This process continued with a careful inward feed until the stop collar prevented further entry which also indicated the stone had completed one pass. Following passes were made after the adjusting screw had been given a slight turn to increase stone projection. The final pass was made with the stone dressed to within 0.0001 in. of the bore diameter.

A good supply of honing oil was used during the entire operation to aid cutting action and to flush away abrasive particles. Had these particles not been disposed of, the tool would soon act as a lap to ruin the cylinder beyond repair. Upon completion, it was almost impossible to detect the area where the plug was fitted, and the altered cylinder functioned as well as an original part.

Hugo Velander, experimental machinist, Roy C Ingersoll Research Center, Des Plaines, Ill

Master Fixture Positions Work for Accurate Hole Spacing

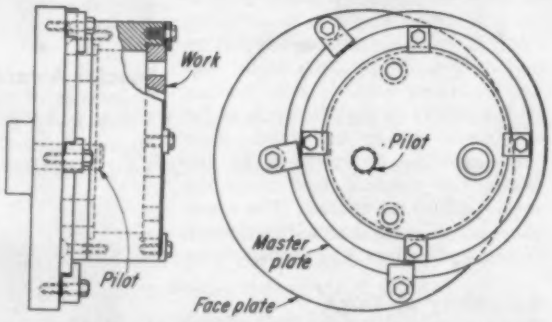
Many of the smaller jobs which would ordinarily be consigned to the jig borer can be done just as accurately and sometimes faster in a lathe.

These facts were borne out when we recently had to bore a few various-size holes in a number of round plates. The lathe, however, was not selected in preference over the jig borer; it was more a matter of expediency because the jig borer was tied up.

As shown in the drawing, the fixture is an independent unit mounted on a faceplate made up for this job. This doesn't preclude the use of a standard faceplate; we just didn't have one we cared to drill holes into. In any case, a sturdy pilot must be attached and machined to absolute concentricity.

The fixture itself is made up of two parts: a master plate or, if you will, an indexing base plate, and a nest ring made either from a casting or a piece of heavy-wall tubing. All hole locations in the master plate (one for each hole in the work) are bored in the jig borer for best accuracy; and all are made the same diameter to slip fit the face-plate pilot. The periphery of the plate is machined in three steps; one surface provides a land for strapping the fixture to the face plate and another forms a boss for the nest ring.

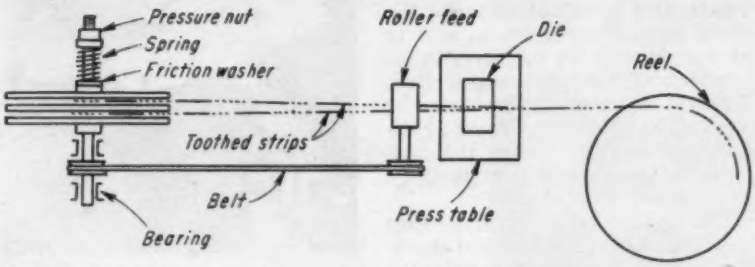
After the ring is faced and bored to fit the master-plate boss, the two parts are joined with flat-head



screws. And, once the assembly has been mounted and indicated on a faceplate, the end of the tube is faced and the work nest recessed. Holes drilled and tappped in the face of the tube for work-holding straps complete the construction.

Now, when a piece is strapped in the work nest, a hole is bored to the size and shape required at the location centered by the master plate. Each subsequent hole is indexed by loosening the faceplate straps and placing the next master-plate indexing hole on the pilot. Retightening the straps makes the work ready for the second hole. *S. Kasper, Philadelphia, Pa.*

Simple Die Produces Toothed Strip Without Waste



Operating at from 300 to 350 spm with a feed of ⅜ in. per stroke, this die turns out nearly 10,000 ft of toothed strip in an 8-hour day. What's more, there is no waste at all as two strips are blanked simultaneously, the toothed edges facing and interlocking each other.

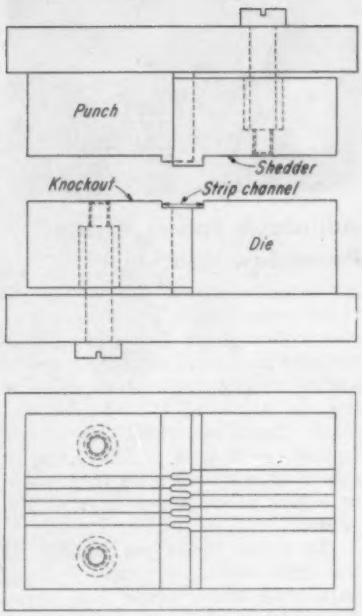
This kind of efficiency probably paints a picture of a complicated die setup, but the tools involved are, in reality, the essence of simplicity. In fact, the die itself is so plain that it employs no stops or locating pilots, (slots or holes for these are not permissible) nor does it sport the customary stripper plate. The job of locating the work is left entirely to a precision roller feed.

The material from which the product is made is ½ in. wide by 0.008 in. thick brass strip, spooled on a large reel which is mounted horizontally on one side of the press. From here the stock is pulled through the die by the feed positioned on the opposite side. At this point, two strips of the finished work emerge and are coiled on two separate take-up reels powered by the feed.

Both of these reels are mounted free running on the feed-driven shaft and are connected to the shaft only through a simple but effective slip clutch. The reason for this is to compensate for the increasing diameter of the work as it collects on the reels. Thus the reels' speed of rotation diminish as the work is taken up.

As to the die itself, construction is carried out in the same way as the first of the tandem hinge-producing dies described in *AM/MM* Oct. 17, '60 p 138. That is to say that the two sections of the die, and the two of the punch are made up of laminates which are pinned and bolted between blocks. All cutting edges are alike; each one producing a round-bottom notch and, on either side, half of the bottoms of adjacent notches. In fact, these contours are so identical that any set of laminates can mesh with another without discernible clearance.

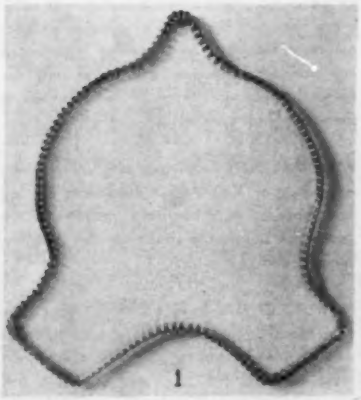
The die, like the punch assembly, is made up of one stationary and one spring-loaded unit. In the die, the spring-loaded half serves as a knockout, rising to the fixed-die surface and joining it to form a strip-material channel. The spring-loaded half of the punch, on the other hand, operates a little differently. Here it has a dual purpose; it acts as a shedder as well as a hold down to contact the material before blanking takes place.

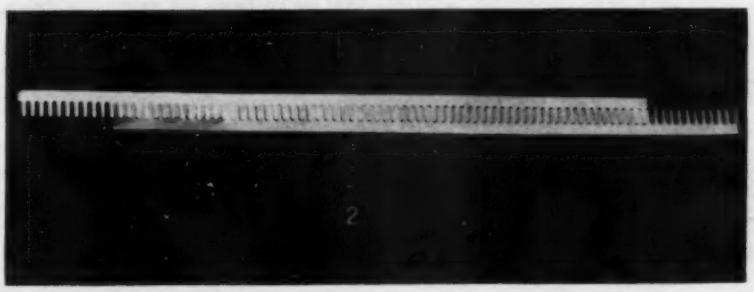


Now for the purpose of the finished product . . . the toothed strip. It is bent into a U-channel shape and applied to jewelry cases and etuis as a decorative edge binder. Photo No. 1 shows a finished-formed strip ready to be attached to an etui. It typically illustrates the curvatures that can be assumed, a definite advantage over the old method of notching as you go and only where absolutely necessary.

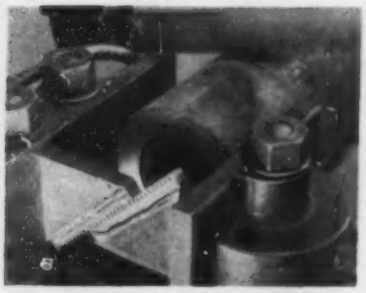
Photo No. 2 shows a section of two strips produced together then separated and again meshed but 13/16 in. out of original synchronization. I did this to show the uniformity in the teeth—that over the entire strip there are no misfeeds which could produce a narrow tooth as often as every ⅜ in.

Pablo Dryere, Mexico City, Mexico





Practical Ideas

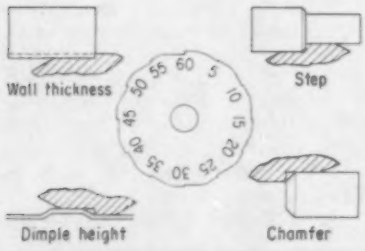


Adjustable Spacer Assists Power-Saw Vise

It's virtually impossible to hold stubs of bar material in a power hack-saw vise without some means of keeping the jaws parallel. Though this is well known among users of these saws, few do anything to organize and make things easier for themselves. Instead, each time a like situation comes up, a search is on for a block or a jack screw which is later discarded.

The photo shows our solution to this time-wasting practice. It is an adjustable spacer made from scrap material and kept near the saw at all times. It is made by bandsawing a squared piece of plate diagonally to make two matching triangular pieces. A short section of scrap gear rack is then welded to the hypotenuse surface of each triangle. By meshing the rack teeth, the blocks can be set to match the diameter of the work being sawed.

H J Gerber, Stillwater, Okla



A General-Use Step Gage

I designed and made this gage to check chamfers, shoulder heights, embossments or dimples, and even tube-wall thicknesses—to mention but a few of its many applications. It is not, however, meant to replace such instruments as depth gages, vernier calipers, or micrometers in accuracy, but to save them wear and tear and also to provide a means for making quick checks.

The gage can be made from either flat ground stock or a thin piece (about 3/16 in.) sliced off round bar stock. Its diameter is 2½ in. with 12 steps ground on the periphery in increments of 0.005 in., ranging from 0.005 in. to 0.060 in. Each step is ground square with the centerline and parallel with a flat; the final grinding being made after the gage is hardened.

The application in which my gage sees the most service is that of checking chamfers. I then place the gage against the profile of the work and rotate it until the matching step is found. Other applications are illustrated in the accompanying sketch.

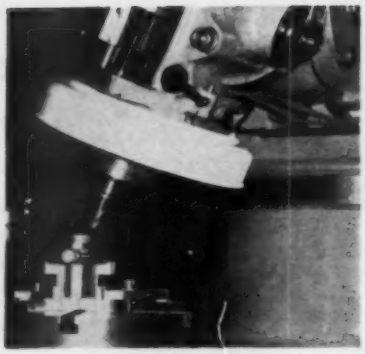
All dimensions given are actual, but are also typical for gages of any diameter or number and size of steps.

Ernest Goulet, East Haven, Conn

Light Surrounding Spindle Improves Vision

In vertical milling, a cool soft light, without glare or shadows is excellent for cutting to layout lines. Such a light is easy to obtain with a circular-fluorescent tube mounted around the spindle of the machine.

Our way of doing this was to purchase a complete Circline 22W kitchen fixture which we stripped for



alteration to our needs. After cutting a 4 7/16-in. hole in the base (slightly off center for greater visibility at the front) to accept the spindle quill, and a 5/16-in. hole for mounting, we painted the inside white and set the lamp socket and clips inside.

Thus the base served as a shade carrying only the tube and the starter button. The transformer was hung out of the way at the rear of the machine from where it was connected to the lamp with well insulated cord.

The mounting hole was fitted with a short 5/16-in. stud which conveniently permits fastening the light in the hole on the machine provided for an indicator-mounting rod. This makes it an easy matter to remove the light if, for some reason, it should be in the way.

Ralph S Bradley, Seekonk, Mass

Richard Prince
Sioux City, Iowa
Won $25 for his idea:

Reamer Assembly Aligns Itself
in the Feb 20, 1961 issue

AN EXTRA $25 will be paid for the best Practical Idea in each issue of *American Machinist/Metalworking Manufacturing*. Selection of the winning ideas made by a group of our readers.

PAYMENT—in addition to regular rate for item published—will be made as soon as tabulations are completed. The winner or winners—in case of a tie when duplicate prizes will be awarded—will also be announced in these pages.

JUDGES . . . are a group of *American Machinist/Metalworking Manufacturing* readers who select articles they prefer in a particular issue. This group changes entirely with each issue and represents a true cross-section of our readers. Their decision is accepted by the editors, without reservations or bias, as final in each case.

REQUIREMENTS—All items appearing in the Practical Ideas pages are eligible. They must be submitted by the originator on an exclusive basis. Do not worry about your shortcomings as an author, draftsman, or photographer—every item will be edited in accordance with *American Machinist/Metalworking Manufacturing* standards. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of McGraw-Hill Publishing Co. Inc, and those of its advertising agencies or departments. Suggest to your employes that they submit ideas.

HOW TO ENTER—Send all entries to: "Practical Ideas Editor" *American Machinist/Metalworking Manufacturing*, 330 West 42nd Street, New York 36, NY.

Carleton Shugg

might well have coined the phrase, "The improbable will be done immediately; the impossible will take a little longer." From keel laying to launching (always in record time) he has masterminded construction of atom subs from the Nautilus to the new Polaris-firing Ethan Allen. Meet America's No. 1 . . .

Sub builder

"I'm not really a metalworking man. Last time I actually did anything like that was when I was assigned to a machine shop one summer while doing postgraduate work at MIT. I remember all I did for a whole week was hand file a piece of steel."

Now *really*, Mr. Shugg. One doesn't run a company noted for its metalworking innovations and for an end product that is dazzling in its complexity without knowing *something* about metalworking.

Building the atom subs

But modesty is inherent in Carleton Shugg, who as president of General Dynamics' Electric Boat Division has earned Navy accolades for record production of much of America's new atomic underwater fleet—from the original Nautilus to such Polaris-firing giants as the George Washington, Patrick Henry, and Ethan Allen.

He has even won rare-as-hen's-teeth praise from the Navy's *enfant terrible*, Vice Admiral Hyman Rickover, father of the atomic submarine fleet.

Honored by Navy

Early this year, Shugg was awarded the Navy's Distinguished Public Service Award for "foresight, organizational ability and leadership" and for "outstanding contributions in the design and construction of the nuclear-powered missile submarines George Washington and Patrick Henry."

Shugg accepted the award (he hates speechmaking, incidentally) "on behalf of the entire Electric Boat team who have made this possible. They are the people who have been responsible for what we have been able to accomplish."

Nothing very original about that—it has been the standard acceptance speech since time immemorial—except that Shugg meant every word of it.

Seldom has a man remained so untouched by praise from high quarters, and seldom has a top executive of a top company been so content to remain in the background "because then I can do some *real* work."

He is the bane of existence to Electric Boat's staff photographers. At launchings, they will line up Navy brass and Defense Department officials along with Shugg—and snap the picture only to find that he has walked off with his back to the camera.

In fact, on leafing through back copies of Electric Boat's house organ, it is hard to find pictures of the company president, and those that do appear are usually long-range shots taken without his knowledge.

Nose for trouble

It is axiomatic at Electric Boat that "there is room for everything on a submarine except mistakes." And it is Shugg's faculty for anticipating production troubles that has put atom subs into the water in record time and with a minimum of bugs to be ironed out. He has a real

nose for trouble. Months before a sub goes into production, while the ink is still wet on the plans, Shugg will spot incipient production troubles and put people to work correcting them before they become bottlenecks.

"It's positively uncanny how that man can get things into focus just by asking probing questions at a single meeting," an Electric Boat executive says.

"The last holdout"

Shugg is deeply dedicated not only to submarines but to the men who build and run them. In a quote from the recently published "Polaris!" by James Barr and William Howard he said:

"Shipbuilding is the last holdout against the assembly line. It's a crazy but wonderful business.

"The men feel it. They see the boat grow from the keel. They even get to see the sponsor's legs. Later on, they get to know the crew. The ship is a part of them, even though they've been through hell to get her into the water. And they follow carefully everything that happens to her."

Although he has been around the sea and ships practically all his life, Shugg does not classify as a sailor in the strict sense of the word and "No operating submariner would ever call me a submariner," he says ruefully.

Annapolis graduate

Yet he is a graduate of the United States Naval Academy, and served nine years' active duty with the Navy from 1920 to 1929. During that time, he took his master's degree at Massachusetts Institute of Technology in naval construction. His master's thesis, incidentally, was on submarine construction.

Shugg did manage a spell as chief engineer on a destroyer, but was soon marked "engineering duty only" because of color blindness.

Even though he left the Navy in 1929 to take a job as a factory manager with Sprague Electric at North Adams, Mass, he returned to ships and the sea 11 years later as production manager for the Cramp Shipyard in Philadelphia.

In World War II, he became general manager of the giant Todd Shipyards in Brooklyn, NY, and Hoboken, NJ. He has rarely been away from ships since.

The one exception to this was a job with the Atomic Energy Commission as manager of its Hanford, Wash, works in 1947. A year later, he was tranferred to Washington, DC, as deputy general manager of the entire AEC operation.

AEC experience, too

At the time, the atomic sub was only a gleam in Uncle Sam's eye, but somehow everything Shugg has ever done has pointed him toward his greatest accomplishment, building the missile-carrying atomic submarine fleet.

He was thus able to combine his knowledge of atomic energy with his ship- and submarine-building know-how when he came to Electric Boat as assistant general manager in 1951.

"Funny thing," he reminisces, "at Hanford we had maybe a hundred acres of buildings and installations all devoted to servicing a single atomic reactor, including all kinds of safety devices and backup features to protect the workers.

Living with the atom

"When we went to work on the atomic sub (the Nautilus) we built in the same kind of reactor, less powerful I admit, geared to pitch and roll with the ship. At Hanford, nobody was allowed to live within miles of the reactor. On the Nautilus, men slept only feet away from it. You might say they were shacked up with the reactor."

Not only that, Shugg will tell you, there are no concrete blockhouses around when a Polaris missile is fired from one of the new atomic subs. In fact, the crews must not only master everything civilian engineers, scientists and contractors throw at them, they must live cheek-by-jowl with atomic reactors and with nuclear-tipped missiles for months at a time.

Dedication to the job

Shugg and his wife were just about to leave on a long and well-deserved vacation cruise when orders came through to start work on the George Washington, first of the Polaris-carrying atomic subs. He promptly canceled the cruise and pitched right in on production problems.

It was this dedication to the job that helped deliver the George Washington exactly 24 months after the contract was awarded, eliciting warm congratulations from Vice Admiral William F Raborn, chief of the Polaris program, "to a wonderful shipyard."

Shugg and the Electric Boat people topped their George Washington speed record by turning out the GW's sister ship, the Patrick Henry, in just 22½ months from keel laying to launching, bearing out a favorite Shugg saying, "We find it's easier to do something twice as fast."

With the first Polaris subs under its corporate belt, Electric Boat is just now getting into "repeat boats" —in other words is in quantity production of ASW (anti-submarine warfare) subs, as well as those for the Polaris program.

City under water

As Shugg puts it, "A sub has every function found in a city—hotel, school, restaurant, communications—plus fighting capacity. It's unique. It's a city, an ocean liner, and a weapon, all in one."

Oddly enough, Shugg finds his greatest troubles with the "nuts and bolts stuff" that goes into a sub, rather than with its complex nuclear components.

"Lack of reliability in such commonplace things as valves and pumps is a universal disease today," he says, "We've got to get routine hardware good enough to keep pace with new developments."

Ventures into R & D

Because submarine production is a feast-or-famine business, Shugg has been instrumental in getting Electric Boat into several rather esoteric R & D projects—most of them somehow pointed toward space travel "because a sub has the same problems as a space ship, except that it travels through water." Among them: photo synthesis of algae (growing edible seaweed under radiation), conversion of urine and wash water into potable water, and thermoelectric conversion of power for air conditioning.

In his spare time, what little there is of it, Shugg *really* gets away from it all in his 36-foot yawl. "It's built to sleep four, but usually just Mrs Shugg and I go. We have no ship-to-shore phone, so we can really pull the veil. That's the trouble today, too much communication. Man's got to get away once in a while. Even so, we never get very far. Longest trip we've ever managed was 50 or 60 miles over last Labor Day weekend."

But that's the penalty Shugg pays for living with crash programs and working with men like Admiral Rickover ("His idea of a long time is an hour"), and this submariners' submariner (his own opinion to the contrary) wouldn't have it any other way.

Names in the News

Heald Machine Co, Worcester, Mass, has named **Edwin J Keyes** (left), formerly vice president and works manager, vice president of manufacturing. **G Harding Allen** (center) moves up from assistant works manager to works manager. **A Francis Townsend** (top right), formerly vice president, engineering, has been named vice president, manager of the Grinding Machine Division, and **Albert A Arbogast** (lower right) formerly branch manager of the company's Detroit sales office, has been made manager of the Bore-Matic Machine Division

Rockwell Manufacturing Co, Pittsburgh, has named **E L Tabat** vice president, marketing, for the Power Tool Division with responsibility for the combined marketing operations of Delta and Porter-Cable. **J J Diamond** has been named eastern sales manager and **B E Coon** western sales manager. They will handle both Porter-Cable and Delta sales.

Sylvania Electric Products Inc, New York subsidiary of General Telephone & Electronics Corp, has elected **Gene K Beare** president. He succeeds **Robert E Lewis** who has resigned to become president and chief executive officer of **Perkins - Elmer Corp,** Norwalk, Conn. Mr Beare previously had been president of General Telephone & Electronics International Inc with overall responsibility for manufacturing in the parent company.

Bijur Lubricating Corp, Rochelle Park, NJ, has named **William E Durnan** executive vice president. He was formerly general manager.

US Hoffman Machinery Corp, New York, has elected **Harold Cohen** vice president. **Robert S Hirsch** has resigned as vice president because of ill health.

Westinghouse Electric Corp has appointed **James R Robbins** product line manager of electrodes and brazing for the Westing-Arc Department.

Farrel-Birmingham Co, Buffalo, has appointed **Allan B Chirgwin** chief engineer. He will direct the engineering and design of the company's line of gears, gear units, and gear machinery. **John Drew** has been named product sales manager, milling machines, at the company's Consolidated Machine Tool Division in Rochester, NY.

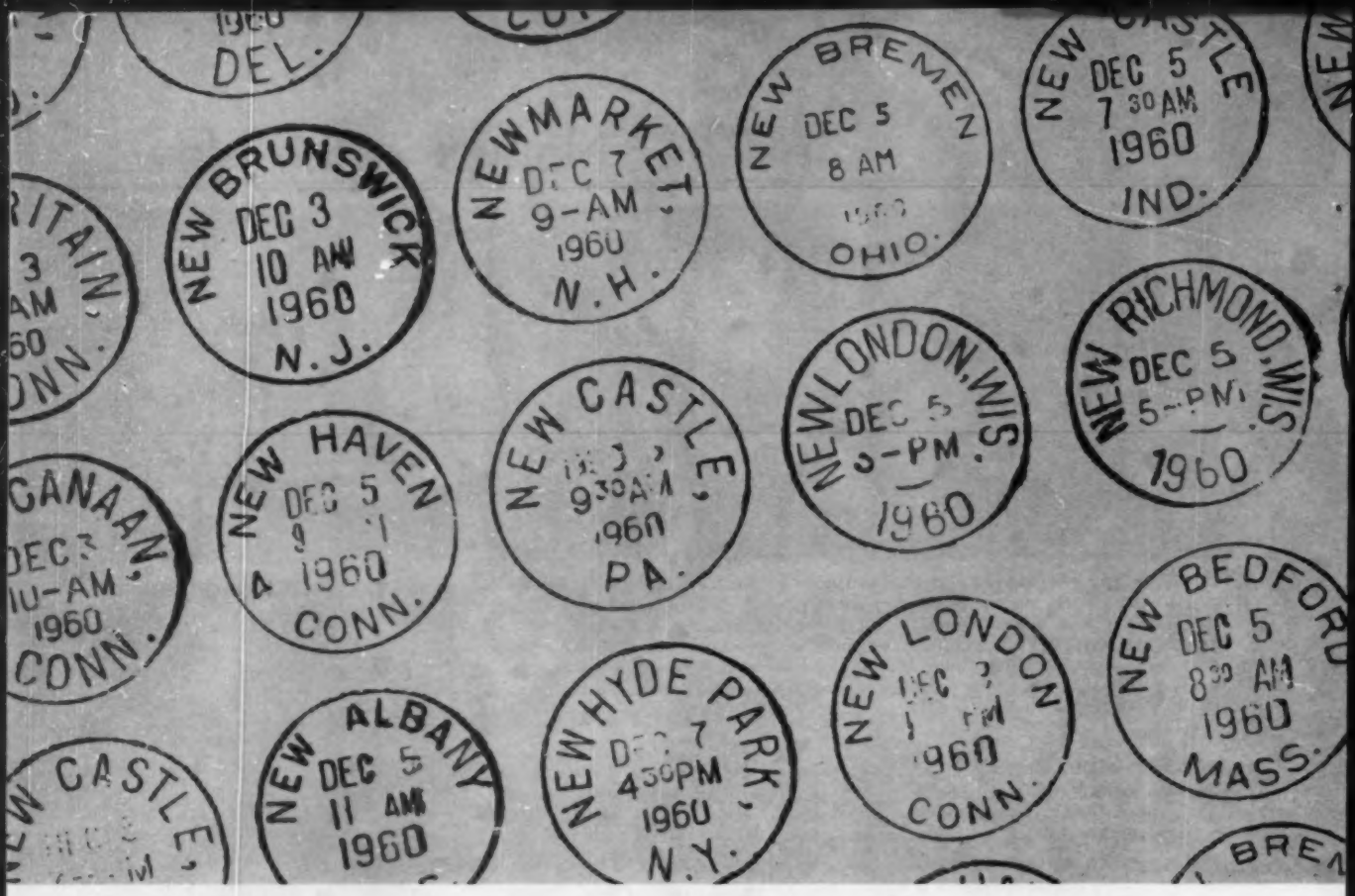
Fafnir Bearing Co, New Britain, Conn, has elected **Keith T Middleton** president. Formerly executive vice president, he succeeds **Clarence G Rosensweig** who has been named vice chairman of the board

Pratt & Whitney Co, West Hartford, Conn, has named **Mark G Channing** vice president in charge of planning. He was formerly associated with Chrysler Corp as director of market representation

Hevi-Duty Electric Co, Watertown, Wis, has named **R G Martinek** sales manager of its five furnace and oven product lines. He will continue to act as manager of special industrial furnace sales. **C A Newton** has been appointed product sales manager of the light industrial furnace line. He has been serving as an application engineer on this line.

Allis - Chalmers Manufacturing Co has appointed **Roy M Casper** general manager of the Power Equipment Division. He succeeds **J W McMullen** who has retired after 45 years of service with the company. Mr Casper, who is a vice president of the firm, has been general manager of the Atomic Energy Division.

(continued on p273)



Wherever your tooling operation is located... here's a low-cost answer to common headaches

From New Haven to New Castle and points West . . . wherever toolmen want a simplified, low-cost answer to many tooling problems . . . Carpenter STENTOR (Oil-Hard) enjoys tremendous popularity. Here's why: STENTOR is one die steel you can live with. Its sound, uncomplicated analysis . . . free from hard-to-machine alloys . . . saves as much as 10% in machining costs. STENTOR is easy to heat treat . . . hardens at a low temperature of 1425°F to 1525°F. You'll like its freedom from decarb because STENTOR holds size so accurately many people do not even grind STENTOR tools after hardening. Little wonder it is the most widely used of all die steels in the Carpenter Matched Set of twelve! Put through an order now—you can get prompt delivery from your nearest Carpenter Service-Center.

Carpenter steel

You can do it ***consistently*** better with Carpenter Tool and Die Steels

The Carpenter Steel Company, Main Office and Mills, Reading, Pa.
Alloy Tube Division, Union, N. J.
Webb Wire Division, New Brunswick, N. J.
Carpenter Steel of New England, Inc., Bridgeport, Conn.

CIRCLE 355 READER SERVICE CARD

Carpenter Tool Steel Hardens in Air To Tensile Strength of 350,000 psi

Carpenter Hi Shock 60, an ultra high strength steel, has an unnotched Charpy impact strength of 110 ft lbs at Rockwell C-59 hardness. With heat-treating, the steel will show a tensile strength of 350,000 psi.

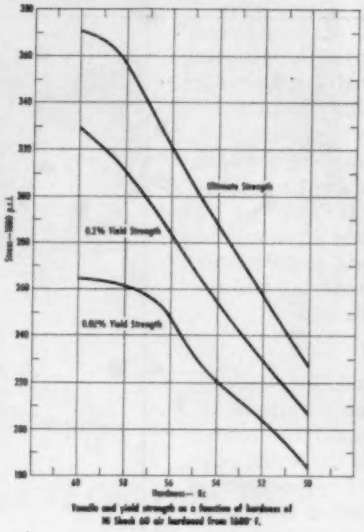
The metal is recommended for jewelry embossing dies, coining dies for parts on which no flash can be tolerated, gun barrels, and dies and fixtures used on hot tensile impact testing machines.

A type analysis of Hi Shock 60 shows: carbon 0.68%, manganese 0.50%, silicon 0.30%, chromium 1.00%, nickel 0.50%, molybdenum 1.00%, copper 2.50% and vanadium 0.15%.

Tools and dies made from the new steel can be air-hardened by heating uniformly to a temperature of 1600 F, depending on size, and the best combination of toughness and hardness with minimum size change is found by tempering at 300 to 400 F.

Forging is carried out at temperatures above 1700 F and annealing a heat-treated tool or die is done at 1300 to 1375 F.

Machinibility of the high strength steel is said to be equivalent to that of standard oil-hardening tool steels such as AISI Types 01 and 02.



The Carpenter Steel Co, Reading Pa

MORE DATA? Circle 76, inside back cover

Allis Chalmers Boron Silicide Resists Extreme Temperatures

Said to be the only high boron content compound that can be used at 2550 F in air for extended periods, boron silicide powder resists oxidation because of a protective coating that forms when the material is exposed to high temperatures in air. To aid the high temperature stability of the powder, it has been specially purified to keep its free silicon content at a low level.

The powder can be fabricated by conventional powder metalurgical and ceramic techniques. It can be hot pressed to give dense bodies, slip cast, and oxide- or self-bonded. Oxide-bonded boron silicide is machinable when presintered at about 2000 F in air and can be sintered after machining at 2500 F in air with virtually no shrinkage.

The 70% boron content makes the powder an excellent material for nuclear reactor shielding and a good burnable poison for absorbing excess neutrons from reactors. Its thermal shock resistance and low oxidation make it also suitable for refractories where other boron materials such as boron carbide and boron nitride cannot function.

Allis Chalmers Mfg Co, Milwaukee, Wisc

MORE DATA? Circle 77, inside back cover

Low-Cost Rust Preventative Is Non-Flammable, Water Compatible

Magnafilm 230 is a non-flammable rust preventative that can be directly applied to dry or wet surfaces. The compound removes fingerprints, absorbs soluble cutting oils, and forms a transparent polar film that will not interfere with visual inspection or impair the legibility of identifying marks.

A normal protective coating is mixed at the ratio of one part of Magnafilm 230 to seven parts water and according to manufacturer a gallon of this mixture which costs $.45 will coat 4,400 sq ft of polished steel surface when dipped at room temperature. To accelerate drying, the dip tank may be heated to 160 or 170 F or the steel may be subjected to heated atmosphere.

Magnus Chemical Co, Inc, South Ave, Garwood, NJ

MORE DATA? Circle 78, inside back cover

"Paste" Magnaglo method ... New "Concentrate" Magnaglo ...

Magnetic Particle Concentrates Mix Instantly Without Stirring

Magnetic flux measuring concentrates can be added directly to the oil in a magnetic flux tester after measuring out the proper amount. A uniform suspension is said to form immediately.

In addition to the easier mixing properties of the new concentrates they reportedly have a measurable increase in fluorescent brilliance over the conventional pastes. The powder-form concentrates are also said to have more closely controlled particle-size range, less foaming, and better corrosion resistance.

The complete family of concentrates consists of eight different materials—four for the visible red or black Magnaflux method and four for the fluorescent Magnaglo method.

Certain concentrates are formulated specifically for oil suspensions, and others are made for use with water. Each concentrate has different characteristics of particle size, magnetic properties, color contrast, and concentration.

Cost of the new concentrates is the same as conventional pastes.

Magnaflux Corp, 7300 West Lawrence Ave, Chicago, Ill

MORE DATA? Circle 79, inside back cover

Simplified method of checking for

GEAR ANGULAR ERROR

RICHARD L. THOEN
General Mills, Inc., Minneapolis, Minn.

Experience has shown that the great bulk of angular error patterns are relatively smooth. As a consequence, the maximum angular error can be established with about 10 readings. Thus, instead of a separate indexing instrument, angular error can be checked with a small optical polygon mounted directly on the gear mounting arbor (or gear shaft), Fig. 1, thus eliminating the bothersome measurement errors due to (a) runout of an indexing spindle, (b) the driver coupling between an indexing spindle and the gear mounting arbor (or gear shaft) and (c) skewness between an indexing spindle axis and the gear axis. It should be noted that the polygon mounting is not critical. A decentered polygon introduces no error, and the effect of wobble is usually insignificant.

Gear roll tester used

A gear roll tester is ideally suited for checking angular error, Fig. 2. The measuring slide is set to the proper center distance (i.e., to the center distance at which the pawl contacts the work gear inside form radius) and locked. The polygon is mounted on the gear mounting arbor (or gear shaft). The gear and pawl are mounted in the roll tester, the micrometer brought to the mid-position and the autocollimator is zeroed on a polygon face. To measure angular error, the pawl is rotated out of mesh, remeshed so as to bring an adjacent face into view, and the angular error is read in the autocollimator. The friction in the mounting centers is sufficient to keep the driven profiles in contact with the pawl.

In cases where the number of work gear teeth is not a multiple of the number of polygon faces, a slight pawl rotation (never more than ½ tooth) is necessary. If the number of pawl teeth is not less than 40 (on a full circle), the pawl rotation will never exceed ±4.5°. Over this range, for a suitable arm length, it is usually permissible to use the approximation 0.001 inch/minute of arc in presetting the pawl.

If desired, peak readings can be checked for the possibility of higher peaks by comparing changes in micrometer settings against corresponding changes in autocollimator readings.

A side advantage of checking for angular error on a gear roll tester is that erratic readings can be checked for dirt and burrs by simply releasing the measuring slide lock and reading the tooth-to-tooth composite error.

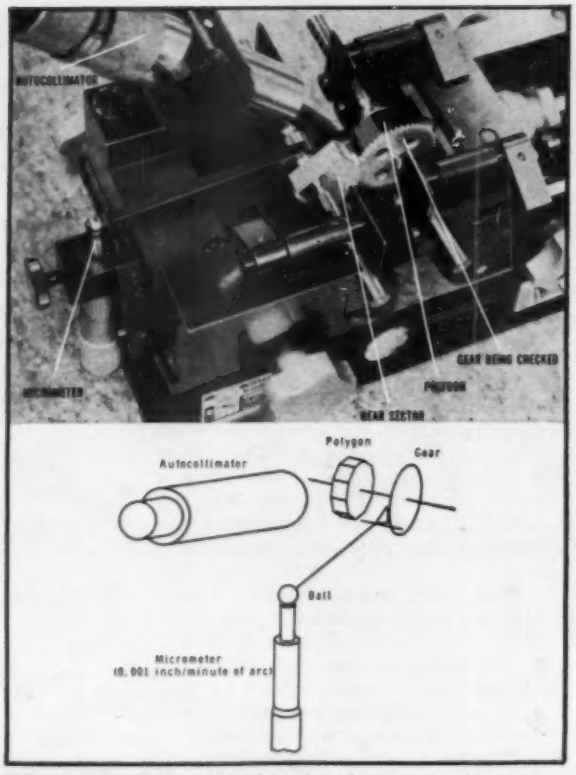


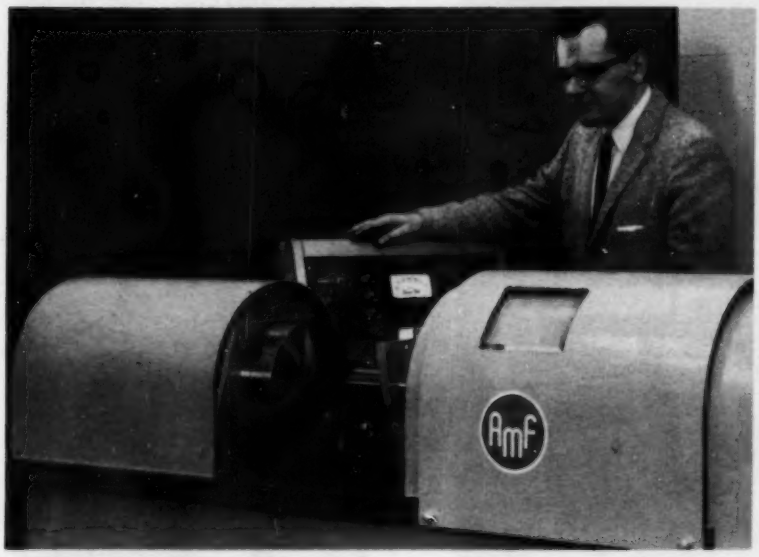
FIG. 1. A simplified method of checking for gear angular error.

FIG. 2. An S & F gear roll tester set-up for checking angular error.

The foregoing was extracted from a paper presented at the International Conference on Gears and Gear Drives held at Essen, West Germany, October 18 and 19, 1960. It is presented here as a service to the fine-pitch gear industry. Reprints are available on request to Gear Division, Kurt Orban Company, Inc., 36 Exchange Place, Jersey City 2, N. J.

KURT ORBAN
COMPANY, INC.
36 Exchange Place, Jersey City 2, New Jersey

See S & F Gear Testers in Booth 2011, ASTME Tool Show



AMF Friction Welder Uses 12,000 rpm To Spin-Join Metals, Ceramics, and Plastics

This friction welding machine(workpiece station of the waist-high machine is shown)—which was introduced at the Welding Show in New York—spins one material against another at speeds up to 12,000 rpm. This gives a gradual buildup in pressure until the contact surfaces become molten. At this point, the rotation suddenly stops, and the pressure is increased until a weld is made.

The parts are then held in this position until the temperature drops to normal. Result: According to the machine's builder, this form of welding is, for a given size weld, more efficient than conventional welding, and it also has lower power requirements.

In addition, because friction welding uses light pressures and high speeds, there is said to be less deformation or damage to the unwelded sections, less chance for cracks, premature siezing, overstressing, and distortion of the work.

One more bonus: In many cases, materials that ordinarily require fluxes or gaseous atmospheres for welding can be joined with this process without these aids.

Since the process takes place along a circular path, the friction welding unit is particularly suited to joining bars or tubes.

American Machine and Foundry Co, Research and Development Div, 689 Hope St, Springdale, Conn

MORE DATA? Circle 51, inside back cover

Ultrasonic Flaw Detector Needs No Liquid Coupling to Material

The Metalloradar flaw detector (*AM/MM*—Apr 17 '61, p3) needs no liquid coupling for normal operation because of a synthetic membrane that fits tightly over the transducer. The membrane couples an ultrasonically vibrating crystal to the object being tested and also serves as a protective skin for the barium titanate transducer crystal. This allows materials such as graphite and solid fuel propellants that would be damaged by liquid immersion or oil coating to be tested nondestructively. Another advantage claimed for the membrane is that irregular surfaces such as bolt ends can be tested.

Test range of the machine is 1 in. to 98.6 ft and frequency range is 0.5 to 10 mc/s, obtainable in six steps.

Metalloradar reportedly has a sensitivity that shows a full scale (3 in.) signal from 1/64 in. hole in an Alcoa test block at 3 mcps. Normal criteria for the tester is a 50% signal at full gain shooting through a ½ in. air path at 3 mc/s, and resolution is ⅛ in. at 5 mcps from 5/64 in. hole in an Alcoa test block. Basic price for the unit is $2,750.00.

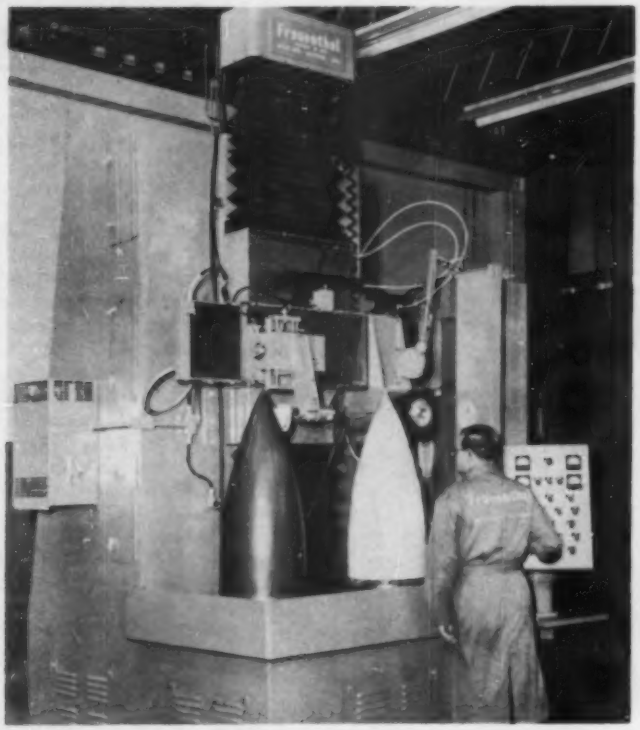
For calibrating flaw detectors such as Metalloradar, a new Circo block will perform the usual functions of calibrating sweep or distance scales, calibrating relative sensitivity of the instrument and transducers, and determining near and far resolution. In addition, a single block can be used to verify refracted angle, determine beam characteristics, and calibrate elapsed time with refracted waves.

Circo Corp, 51 Terminal Dr, Clark, NJ

MORE DATA? Circle 52, inside back cover

VERNIER SCALE for Dead-Weight Thickness Micrometer will give direct readings of ten-thousandths in. from the one-thousandths scale. Throat capacity is 4 in.; dial is anodized aluminum, glass covered—*E J Cady & Co, 630 N Harlem Ave, River Forest, Ill*

MORE DATA? Circle 53, inside back cover



Frauenthal Vertical Contour Grinder Matches 3D-Master Within 0.0005 in.

Model 926, a dual table contour grinding machine, was designed to grind Pyro-Ceram nose cones but may be adapted for other parts. With a three dimensional master on the first table, the machine's electro-hydraulic tracer system will produce a duplicate on the second table to within 0.0005 in. of the master.

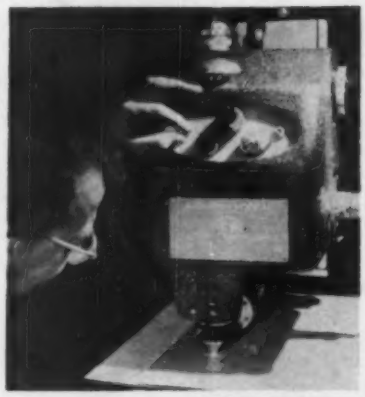
Both 15-in.-dia work tables are equipped with vacuum chucks and rotate together in a 1 to 1 ratio throughout a speed range from 2 to 17 rpm. Axes of the two table spindles are parallel to each other and to the vertical slideways within 0.0002 in. in 20 in.

The electro-hydraulic tracer is an all transistorized system that guides both vertical and horizontal travel simultaneously through 180 deg of motion with constant stock removal speed on all surfaces of the workpiece. Max vertical travel of the horizontal slide is 55 in. and vertical feed rate is from 0.025 to 5 ipm.

Models for other specifications are available with work tables up to 178 in. dia and with spindles for boring, turning, polishing, thread grinding.

Frauenthal Div, The Kaydon Engineering Corp, Muskegon, Michigan

MORE DATA? Circle 54, inside back cover



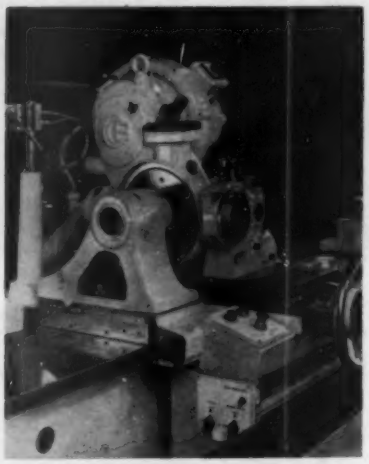
Electronic Tracer Uses Templets Prepared by Conventional Drafting

Aircotron Model J, suited for cutting work of a non-repetitive type, uses templets prepared by conventional drafting methods, cutting costs of the templets and finished work. Customer advantages are stepless cutting speed control and tracing of 90° corners without the need of corner radii. The unit can also be used for chain cutting.

The tracer consists of a scanning head and control, control panel mounting bracket, and raise-lower device available as a manual or electrical unit. Model J uses a small light-sensitive element located in the scanning head to follow the templet line of the part to be cut. Width of the line must be maintained between 0.020 and 0.040 in. The tracer head is mounted on the operating bar of the cutting machine and automatically provides the desired motion of the torches during the cutting operation. The electronic tracer has a cutting range speed from 5 to 24 in. and uses 115-v 50-c single-phase current at 5 amp.

Air Reduction Sales Co, 150 E 42nd St, New York 17, NY

MORE DATA? Circle 55, inside back cover



Whirlmatic Threads Fast With Finish Almost Like Grinding

The Whirlmatic—which is made in Britain by BPS Machinery & Spares Co, Ltd—is a complement to the Bursgmuller thread-whirling process already used by many European machine tool builders. The cutters of the machine rotate at a speed of approximately 1000 rpm and, as a result, give a high cutting rate as well as a finish that is said to be almost equivalent to grinding.

In the thread-whirling process, which this machine uses, a series of single point cutters, ground to the form of the thread to be cut, rotate at high speed in an eccentric path around the work. The ring carrying these cutters is inclined at the angle of the helix of the screw and is driven either by belt or through gears by an independent motor. This can be seen above the saddle in the illustration.

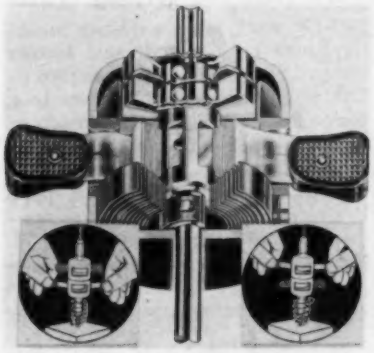
The standard Whirlmatic has a capacity to cut up to 4-in.-dia screws and will cut up to 6 ft of thread in one pass. In fact, longer screws can

be cut, because devices built into the machine insure complete accuracy in picking up and continuing a further cut on a long bar. Machines to take 12-ft screws are available.

In a typical cut reported by the manufacturer, a leadscrew 7 ft long was cut with maximum cumulative error not more than 0.002 to 0.003 in. in approximately 28 min.

Dist by T R Wigglesworth Machinery Distributors, Inc, Alexander Rd, Walton Hills, Bedford, Ohio

MORE DATA? Circle 56, inside back cover



Improved Foster Handle Gives Rapid Production-Line Gaging

Model HD-61 thread gage handle, which gives precision production-line gaging of tapped holes at speeds up to ten times that of conventional gaging methods, is said to reduce replacement costs up to 50%. It accepts both AGD standard Taperlock and reversible adapters.

Its method of operation is shown in inserts, above. Pulling on the lower set of tabs threads the gage into tapped hole, and pulling the top tabs unthreads it. Each full pull of the tabs rotates the gage 8 full turns.

A thread cleaning brush makes possible thorough cleaning prior to gaging. The brush follows the contour of the threads and brings all of the dirt and chips to the top.

Other features of the gage are Mylar slip-in tapes, one-way ball bearing clutch, and self-lubricating plates.

C E Foster Gage Corp, 5341 English Ave, Indianapolis 19, Ind

MORE DATA? Circle 57, inside back cover

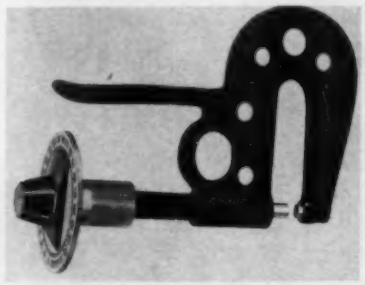
Abrasive Swing Frame Grinders Offered in 20 Standard Models

Company has added a medium-duty series 2 to its line of heavy-duty unit series 3, extra heavy-duty units series 4, and the G & P 6-72 unit series 1. These four basic designs provide the 20 standard models. By changing mountings, accessories, and modifications, unlimited combinations are possible.

Units are available from 2 hp up with air or spring tensioning. Belt sizes are 2 through 6 in. wide and 72 through 132 in. long.

Grinding & Polishing Machinery Corp, 2530 Winthrop Ave, Indianapolis 5, Ind

MORE DATA? Circle 58, inside back cover



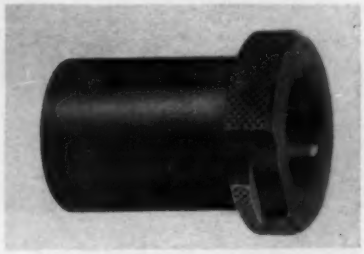
Quick-Acting Dial Micrometer Measures Moving Materials

Dial micrometer is particularly suited for use in rolling mills, for gauging sheet stock thickness while the mill is in operation, and other manufacturing situations where the part to be measured is in movement and the time allowed for measurement is minimized. It can be used by personnel who are unskilled in the use of conventional, difficult-to-read micrometers

One full turn of the spindle covers the entire 0.250-in. operating range. Thickness is quickly read on the large dial. It is available with standard 0.270-in.-dia terminals or with large ¾-in.-dia for measuring soft materials. The adjusting nut assembly of the micrometer provides for full engagement with the spindle thread.

J T Slocomb Co, South Glastonbury, Conn

MORE DATA? Circle 59, inside back cover



TUNGSTEN CARBIDE DRILL BUSHINGS added to company line are available in several types including head and headless press fit, fixed, and slip renewable—*American Drill Bushing Co, 5107 Pacific Blvd, Los Angeles, Calif*

MORE DATA? Circle 60, inside back cover

AUTOMATIC GRADATION POST HEATING machine treats die cast aluminum motor rotors to improve their efficiency (*AM/MM* May 1 '61 p2). Rotors are radiant-heated without flame impingement by automatically-mixed air and propane fuel that burns on cup-shaped refractory surface. This post-heats rotors in 3 to 4 min at production rates up to 400 per hr — *Selas Corp of America, Drasher, Pa*

MORE DATA? Circle 61, inside back cover

Bryant Grinder Finishes Both Straight, Tapered Bores Without Rechucking Work

Specifically designed for grinding both a straight and a tapered bore at a single chucking of a diesel nozzle, this internal grinder has two opposed wheel slides and a rotary indexing table carrying two workheads so that two workpieces can be ground simultaneously.

The dual workhead rotates through four positions automatically; load, straight bore grind, rest, and taper bore grind. The table can also be manually indexed if desired.

Dressing of new wheels is also automatic and diamond sizing is used on both straight bore and tapered bore grinding.

A compound axial and angular slide permits reciprocal grinding of the tapered bore. Total axial stroke of this slide is 3¾ in., angular slide stroke is ½ in., and angular grind stroke is adjustable from 0 to 1/16 in. at 45 to 450 strokes per minute.

The straight bore grinder has a total wheel stroke of 3 in. and a grind stroke of 0 to 1 in. at 30 to 300 strokes per minute.

Maximum swing on the machine is 5⅞ in. dia and work spindle speed is adjustable from 300 to 2700 rpm. Wheel spindles with speeds from 42,000 to 150,000 rpm are available for special work.

Bryant Chucking Grinder Co, Springfield, Vt

MORE DATA? Circle 62, inside back cover

Robodyne Vibratory Feeders Have Interchangeable Parts Orienters

Orientation segments on the TransfeRobot parts feeder can be interchanged in less than a minute so that a wide range of small parts can be fed into automatic manufacturing, assembly, and packaging machines.

The feeders have vibratory bases matched to bowls that are available in two sizes, 18 and 24 in. dia. All interchangeable segments have discharge points at the same location and require no extra tuning of the base motor after a change.

When intermittent parts feed is desired, direct inputs from photoelectric, infrared, and ultrasonic proximity devices can be used to replace moving switch parts.

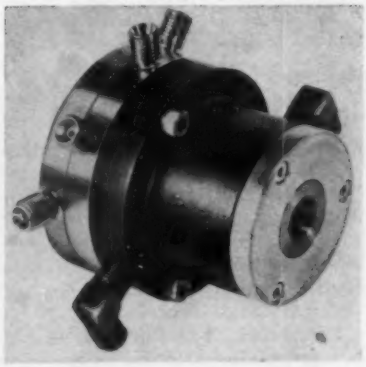
Robodyne Div of US Industries, Inc, 12345 New Columbia Pike, Silver Spring, Maryland

MORE DATA? Circle 63, inside back cover

Work Table Has Leveling System

GP-100 work table combines an interchangeable top and table leveler system with frame that is said to be free of dust traps. Tables come in 4, 5, and 6 ft lengths, formica, masonite, or glaze-weld tops, and accessories include casters that screw into leveler sockets and nestable metal drawers that slide on nylon rollers—*Leitch-Huard Corp, Manchester, NH*

MORE DATA? Circle 64, inside back cover



Module Mixes, Injects Liquids, Solids, Gases, Into Plasma Jet

Arc plasma spray guns with this mixing module attached can inject liquids, solids, and gases into the plasma downstream of the plasma formation. The gun can then be used for high-temperature materials screening tests, chemical synthesis, rocket exhaust and re-entry simulation, thrust measurements, magnetohydrodynamic studies, and spraying of low-melting-point materials.

Modules for 25, 40 and 80 kw hand spray guns are available in two styles: SM 780 has three injection ports and one pressure tap for measuring the condition in the mixing chamber; Model SM 776 has one injection port and one pressure tap.

Plasmadyne Corp, 3839 S. Main St, Santa Ana, Calif

MORE DATA? Circle 65, inside back cover

V-R INSERTS...

FIRST CHOICE of more and more plants

PUREST RAW MATERIALS enable V-R to produce the highest quality carbide grades.

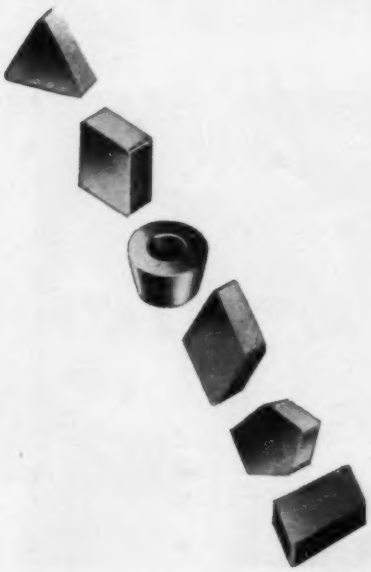
MOST MODERN METHODS, such as vacuum sintering, make V-R grades better, more versatile.

PRECISE PRODUCTION PROCESSES assure accurate shapes, sizes, grades, dimensions and densities.

CONSTANT QUALITY CONTROL guarantees consistently superior performance from V-R inserts.

Contact your V-R representative or write us today for full information on the complete line of V-R Inserts, Toolholders and Face Mill Cutters.

...V-R INSERTS...BETTER FROM START TO FINISH...



CREATING THE METALS THAT SHAPE THE FUTURE

VASCOLOY-RAMET

812 MARKET STREET • WAUKEGAN, ILLINOIS

C-834

Leadscrew Tapping Head Drives Taps From No. 0 to 5/16 in.

Model 2LS Auto-tap that fits any drillpress (but uses it for power only) has actuating lever, stop and depth control as integral parts of its design. Leadscrew carries the thrust while the tap only cuts the thread. Leadscrew's pitch is matched to that of the tap being used, thereby overcoming initial starting torque.

All tapped parts have thread starting at the same point. The tap can be removed after entering a hole and re-entered with no danger of tap breakage or stripped threads. No hold-down or stripper plates are required; inexpensive tapping fixtures can be used.

Ettco Tool & Machine Co, 594 Johnson Ave, Brooklyn 37, NY

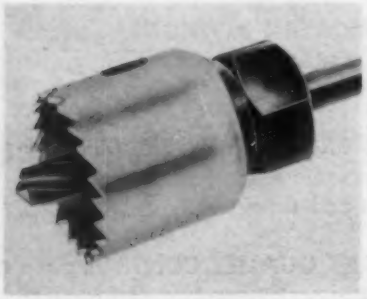
MORE DATA? Circle 66, inside back cover

Multi-Purpose Microscope Has 30, 100, and 400X Magnification

The Optotron combines a coordinate measuring, toolmaking and metallurgical microscope in one instrument with Leit optics throughout. Standard triple nosepiece gives 30x, 100x and 400x magnification. The measuring stage, which is ball mounted, is moved over a range of 1 in. by 1 in. in increments of 0.0001 in., by direct reading micrometers. Low voltage substage and vertical illuminators are included, and course and fine focusing and a depth measuring gage are available as extras.

Opto-metric Tools, Inc, 137 Varick St, NY 13, NY

MORE DATA? Circle 67, inside back cover



Hole Saws Offered in Sizes From ⅝ to 2½ in.

Star Speedi-Cut hole saws, adaptable to electric drills, lathes, and drill-presses, cut holes up to ⅞ in. deep in wood, metal, plastic, and composition board. Holes made with a ¼-in. drill can be extended to 1⅛ in.; with a ⅜-in. drill to 1½ in.; and with a ½-in. drill to 2½ in.

The ⅝-in. saw features a built-in mandrel; the other sizes are interchangeable with various makes.

Victor Saw Works Inc, Middletown, NY

MORE DATA? Circle 68, inside back cover

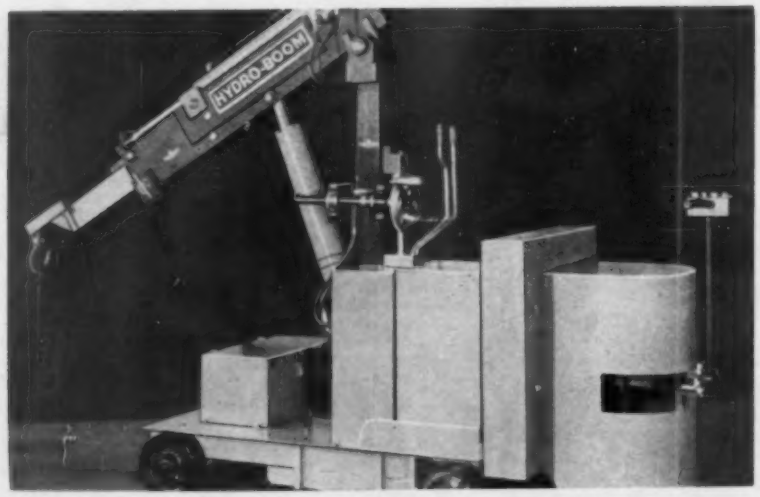
Delta Grinder With Slim Motor Gives Clearance For Long Stock

This 7-in. grinder is specially designed to ease handling of long or odd-shaped stock. The ½-hp motor has a slim profile and the grinders' bell hubs are oval shaped to give extra clearance near the wheels.

These chutes take advantage of the natural fan action of the wheels so that installation of dust collectors is simplified. Motors available for the grinder include 1725 or 3450 rpm.

Delta Power Tool Div, Rockwell Mfg Co, 485 North Lexington Ave, Pittsburgh, Pa

MORE DATA? Circle 69, inside back cover



COUNTERBALANCED MOBILE FLOOR CRANE is said to cut labor by 50% and give greater handling capacity. The new Hydro-Boom Model 135 can lift 3000 lb with the hook 48 in. beyond front edge of platform. Boom movement is hydraulically controlled and gives 0.001-in. accuracy in six directions—*Vanguard Mfg Co, 1908 E 66th St, Cleveland 3, Ohio*

MORE DATA? Circle 70, inside back cover

IN MANY WAYS,

IN MANY PLACES . . .

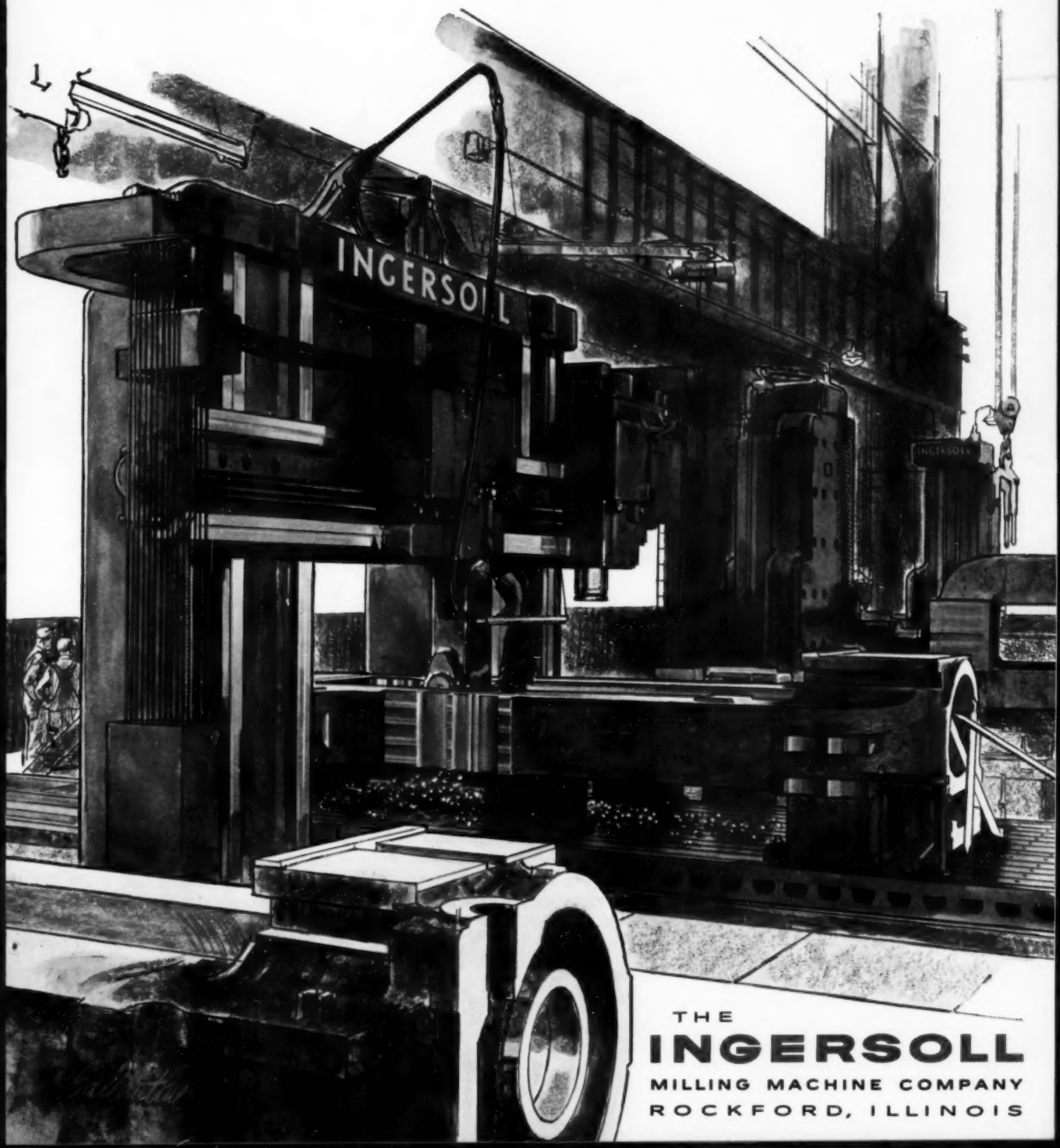
special Ingersolls help to reduce costs, increase profits.

This special Ingersoll is the pivotal machine in the recently expanded and modernized United Engineering and Foundry Company plant at Youngstown.

It reduces the direct costs of manufacturing rolling-mill housings because it machines them four times faster than by customary methods.

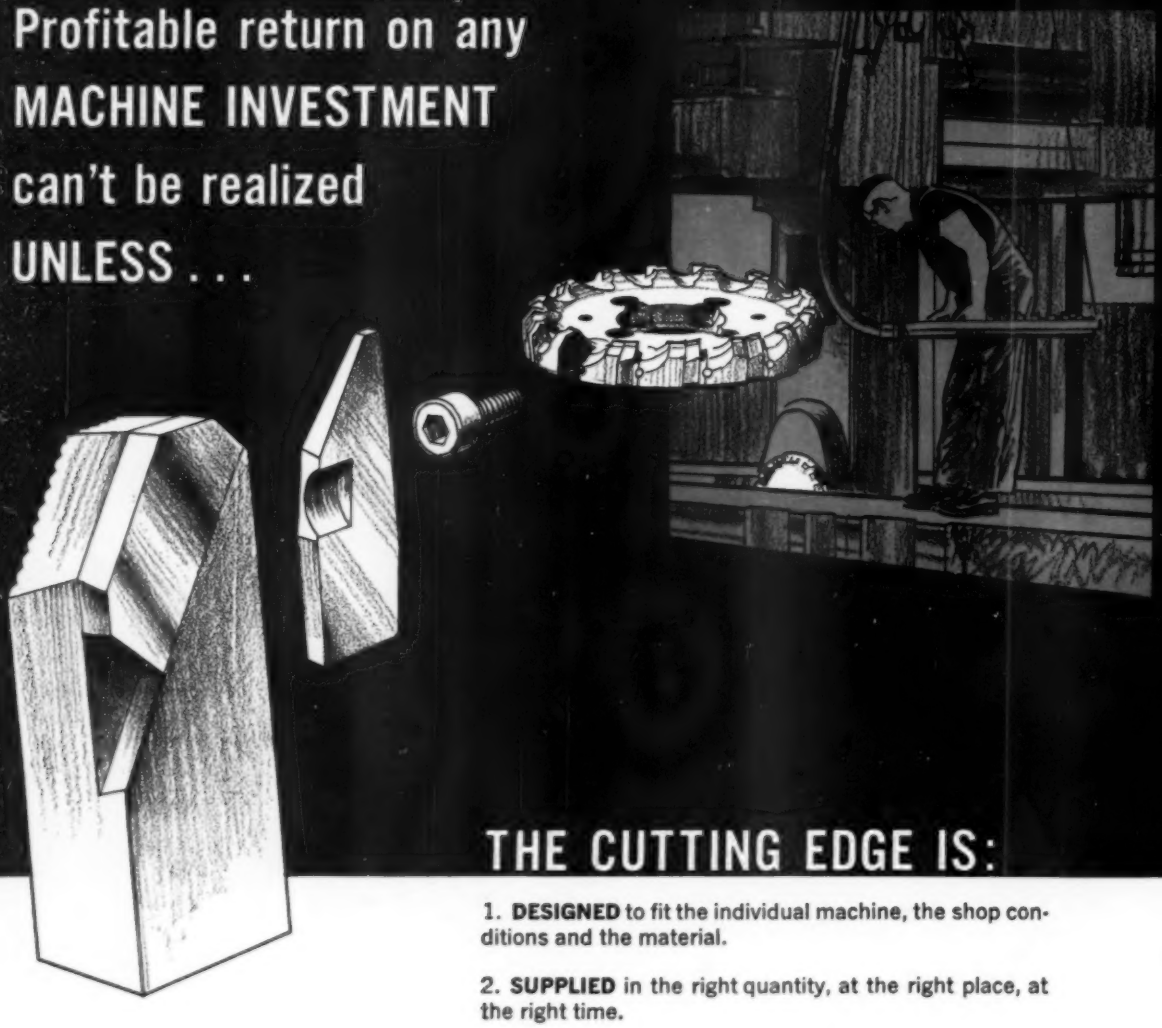
Less easily evaluated are these other important gains: Handling time and demands on cranes have been reduced because all the milling is done on one machine, in two settings instead of six. The shop is no longer cluttered with parts waiting to be machined. Work-in-process inventories are reduced. The steady flow of parts to the assembly floor will speed deliveries to United's customers.

Such benefits are just as real as reduced man-hours, and have more profit significance, even though it is difficult to give them all a specific dollar value.



THE
INGERSOLL
MILLING MACHINE COMPANY
ROCKFORD, ILLINOIS

Profitable return on any MACHINE INVESTMENT can't be realized UNLESS . . .



THE CUTTING EDGE IS:

1. **DESIGNED** to fit the individual machine, the shop conditions and the material.

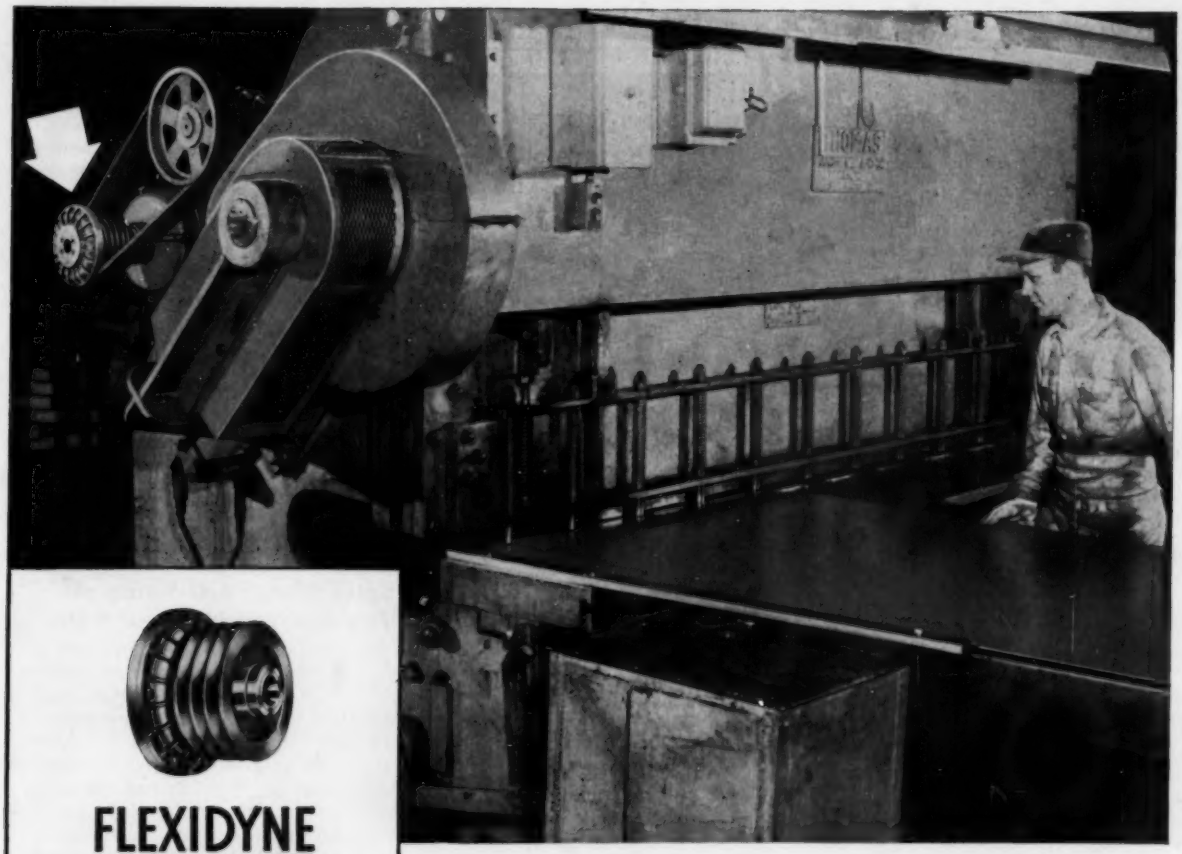
2. **SUPPLIED** in the right quantity, at the right place, at the right time.

3. **MAINTAINED** to provide its original design geometry consistently and to assure maximum metal removal and minimum cost.

Ingersoll's blade and cutter design and manufacturing facilities are unsurpassed. It has one of the best milling cutter and blade testing laboratories in the world . . . the shop where Ingersoll builds, erects and tests special machines. Here milling cutters and blades of virtually every type and kind are continually being evaluated. Cost reducing maintenance procedures are also under constant development.

The true test of cost and performance must incorporate all the conditions and objectives in each user's shop. Regardless of the make of the machine, Ingersoll is equipped and prepared to help the customer determine the *right* blade or cutter for each requirement and to supply them at the *right* place at the *right* time. Ask to have an Ingersoll sales engineer tell you about the Ingersoll Cutter Service and the Blade Back-Up Program. Write:

THE **INGERSOLL**
MILLING MACHINE COMPANY
CUTTER DIVISION 505 FULTON ROCKFORD, ILL.

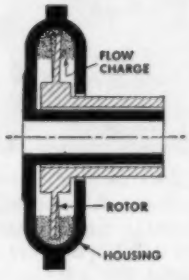


FLEXIDYNE

THE DRY FLUID DRIVE

The "fluid" in Flexidyne is heat treated steel shot. A measured amount, called the flow charge, is contained in the housing which is keyed to the motor shaft. When the motor is started centrifugal force throws the flow charge to the perimeter of the housing, packing it between the housing and the rotor which transmits power to the load.

After the starting period of slippage between housing and rotor the two become locked together and achieve full load speed, operating without slip and at *100% efficiency.*



Look, Folks...No Strain!

– saves motors and V-belts!

– cuts starting current draw!

Introduce Flexidyne into your drive system and your stubborn loads take off smoothly, without the necessity of oversize motors or costly controls. Flexidyne provides the equivalent of a "no load" start, reduces maintenance, protects motors against shock or overload, and operates at 100% efficiency at full load speed!

Across the nation — on shears, mixers, agitators, blowers, chippers, ball mills, cranes, conveyors, cotton cards, jaw crushers, *everywhere* — thousands of Flexidynes are performing brilliantly. Here is the *new and better way* to start loads smoothly!

Flexidyne is available from stock in 8 drive sizes and 10 coupling sizes for capacities to 1000 hp. Ask your Dodge Distributor, or write us for complete technical bulletin.

Dodge Manufacturing Corporation, 100 Union St., Mishawaka, Indiana

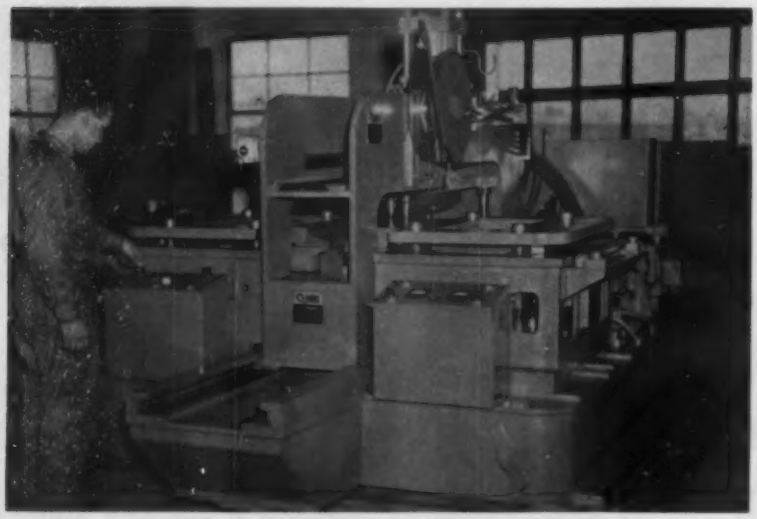
The Products with the Pluses... **DODGE**

of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Look under "Dodge Transmissioneer" in the *white* pages of your phone book. Factory trained by Dodge, he can give you valuable assistance.

◀ CIRCLE 359 READER SERVICE CARD

▲ CIRCLE 360 READER SERVICE CARD



Strip-Welding Machine Eliminates Stop For Changing Coils in Any Operation

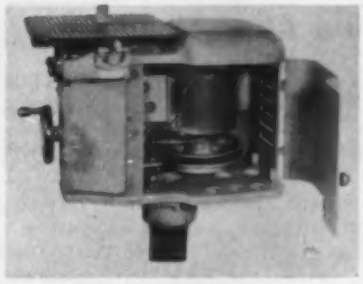
This new machine, which handles strip from 3 to 21 in. wide and up to ¼-in. thick, will allow any strip converting machine, tube mill, roll forming machine, punch press, or draw press to run continuously rather than having to stop for coil changes. While its welder shears the end of the old coil and the incoming end of the new coil, automatically butts them together, and makes the weld, the strip-forming machine is being fed from the looping tower where the strip was stored.

When the coil ends are welded together, the machine is automatically filled with strip again and the strip-forming machine runs continuously.

The welder is the inert gas type, welding with either tungsten arc or wire-fed rod.

The Clark Co, P O Box 316, Walbridge, Ohio

MORE DATA? Circle 71, inside back cover



Line of Profile Grinders Incorporates New Features

Redesigned line extends the range of operations to include grinding of die clearances, cams and contours, plus a variety of finish-grinding work. Hinged access door facilitates interior maintenance; a larger serrated table, 12 x 13½ in., has an improved U-bracket support with a 4-way tilt. The center line of the table coincides with the center line of spindle so that grinding wheels always operate in the center of the table hole at all working angles. Wheel dresser is attached to the under side of the table.

Spindle speeds are available in 20,000, 30,000, and 35,000-rpm ranges for the single speed machines and in 20,000-30,000 and 20,000-35,000 rpm for two speed machines. ½-hp 3450-rpm motors are standard; ¾ optional. These grinders are basically the bench type but may be mounted on a pedestal or floor stand.

Rice Pump & Machine Co, Belgium, Wis

MORE DATA? Circle 72, inside back cover

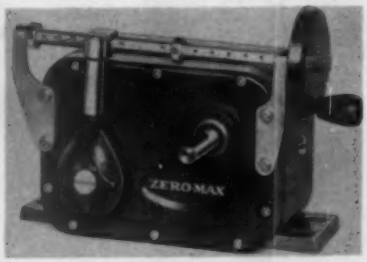
Surface Grinding Attachment Reaches Difficult Areas

Diamond Speedgrind, available in models to fit most surface grinders, is quickly attached. A s'ρless belt tension adjustment eliminates strain on the bearings and the belt contacts 65% of the driven pulley's surface. Four super-precision ball bearings are lifetime-lubricated; 17,000 rpm are delivered at 3600-rpm drive spindle speed.

Unit is available with a choice of 3/32, ⅛, 3/16, or ¼-in. collet or a mandrel for ¼ or ⅜ - in. - ID unmounted wheels. Recommended wheel diameters are 3/32 to 1½-in. Price is $295 with steel storage case.

Speedline Sales Co, 12860 Fish Ave, Warren, Mich

MORE DATA? Circle 73, inside back cover



Speed Control Aids Setting of Zero-Max Variable Speed Drives

Optional screw control mechanism as available for more precise setting of these drives. Forty-seven full turns of the handwheel are required to move the control from the zero rpm setting to the maximum speed setting on the drive. It can be easily adapted to remote control.

Designed to permit conversion of most Zero-Max drives from standard lever control to screw control by the user in his own shop, the device can be mounted for either right or left side operation. Models with torque output exceeding 100 in.-lb should have the screw control.

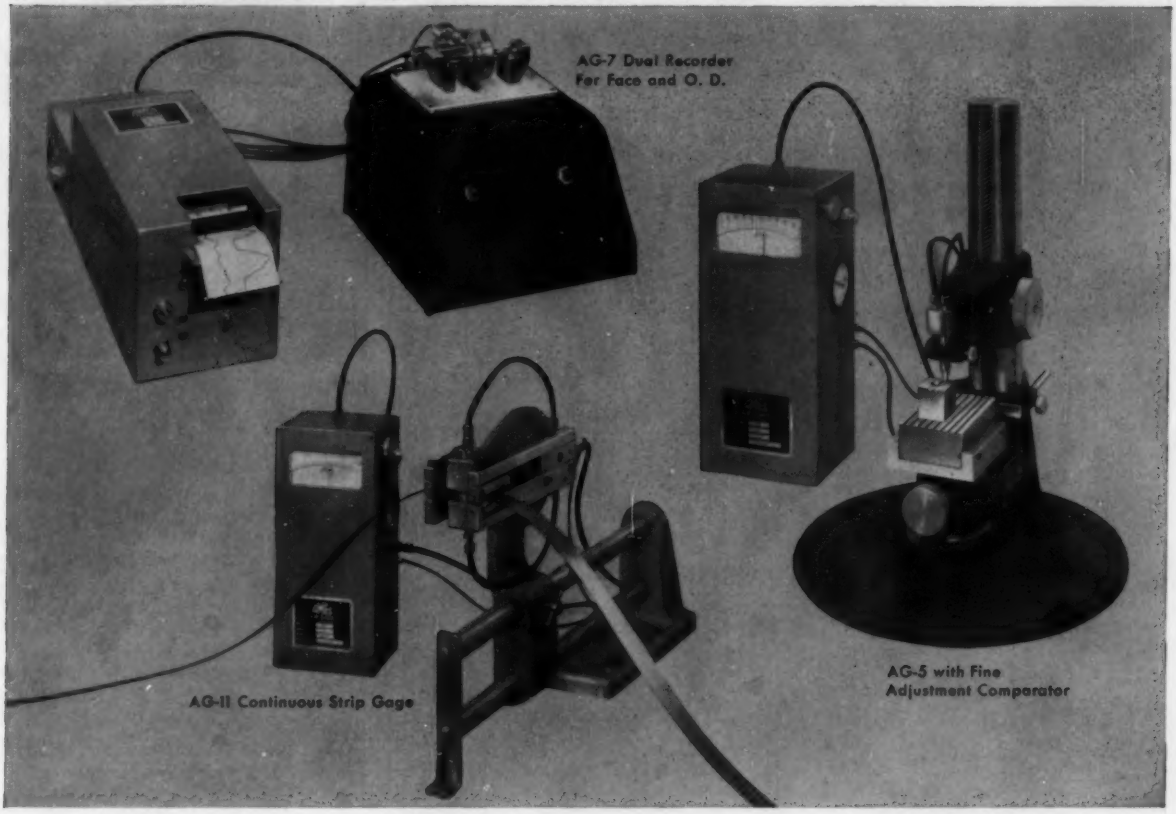
Zero-Max Co, 2845 Harriet Ave S, Minneapolis 8, Minn

MORE DATA? Circle 74, inside back cover

TINY ALUMINUM RIVETS are as long as the thickness of a half dollar. They are produced by one cold heading machine from 0.042 in dia wire at 90,000 to the pound. The 5/64-in. long rivets are designed for assembly of hearing aids and transistor radio receivers—*Aluminum Co of America, 1501 Alcoa Bldg, Pittsburgh, Pa*

MORE DATA? Circle 75, inside back cover

AMES *Masters of Measurement*



ACCU-FLOW AIR GAGING EQUIPMENT

The new line of ACCU-FLOW air gages developed by B. C. Ames includes several patented components, including nozzles and pressure indicators, which give these gages unusual range and exceptional linearity.

Special Models are Available for Checking: outside and inside diameters, center distances, flatness, roundness, hole depths and continuous non-contact measuring or comparing of paper, metals, plastic films, etc.

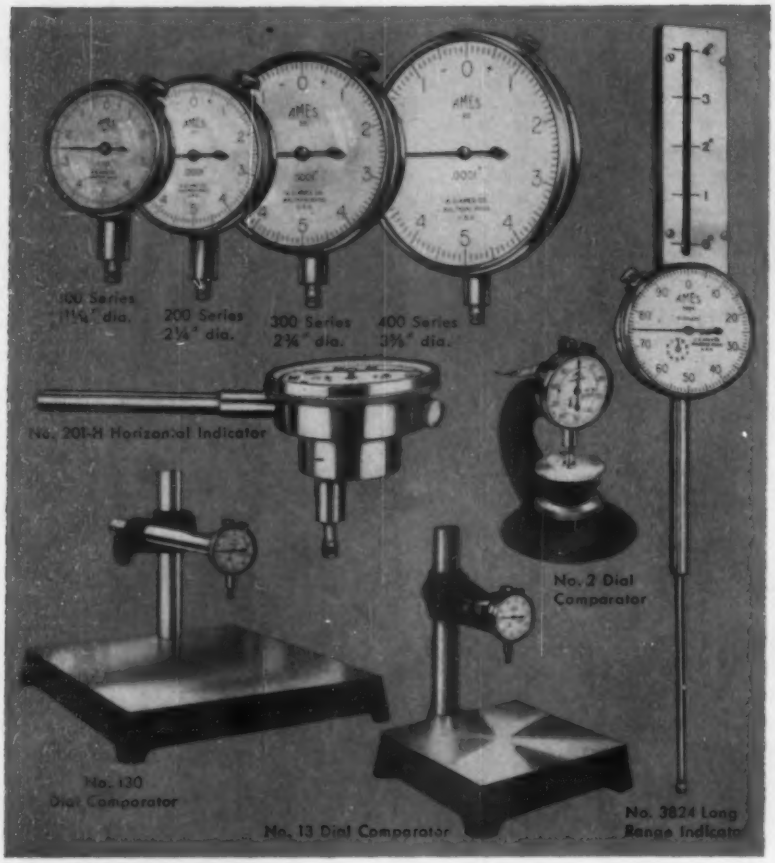
Ames ACCU-FLOW Air Gages are providing the answer to many measuring problems that were once considered impossible to solve. For complete information on the entire line of Ames air gaging equipment, write for new ACCU-FLOW folder. *You're asking for the best when you specify Ames!*

B. C. AMES CO., Waltham 54, Mass. Representatives in Principal Cities—
In Canada, H. C. Burton Co., 166 Rebecca Street, Hamilton.

B.C. AMES CO.

MANUFACTURERS OF MICROMETER DIAL INDICATORS, DIAL GAUGES, ACCU-FLOW AIR GAGES, PORTABLE TRANSISTORIZED COMPARATORS

AMES *Masters of Measurement*



Dial Indicators and Gauges

Use Them for Checking: taper, height, depth, flatness, roundness, straightness, thickness, diameter, length and size.

Features Include: easy-to-read dials, unbreakable crystals, forged cases, backs and wheel support, contour-lapped pinion teeth.

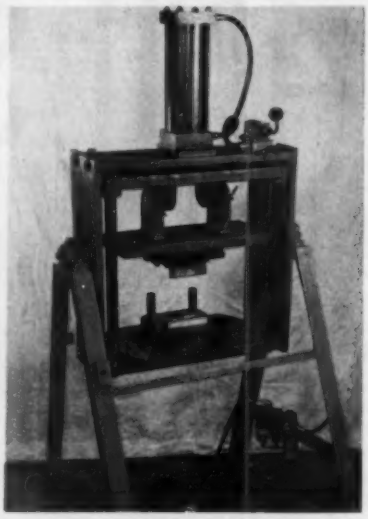
Attachments: rubber and metal dust guards, long stem indicators, tolerance hands, lift levers, special backs, contact points, etc.

For literally hundreds of measuring, indicating and comparing operations, you'll find Ames standard and customized gauges and indicators unerringly accurate and amazingly durable . . . *You're asking for the best when you specify Ames!*

B. C. AMES CO., Waltham 54, Mass. Representatives in Principal Cities—In Canada, H. C. Burton Co., 166 Rebecca Street, Hamilton.

B. C. AMES CO.

MANUFACTURERS OF MICROMETER DIAL INDICATORS, DIAL GAUGES, ACCU-FLOW AIR GAGES, PORTABLE TRANSISTORIZED COMPARATORS



Pneumatic Spotting Press Has ½-Ton Capacity

The A W spotting press (mounted on casters) is designed to make easier the spotting of punches and pads on dies used to make all types of small metal stampings. It can also be used for short-run subassemblies and prototype work. The complete unit can be tilted to any desired angle and, locked in position, it will rotate 360°. The punch retainer is designed to swing forward or backward 90° and is locked in position to bring work directly in front of the operator.

Two models are available, Model 100 and 150 which is equipped with inching controls for use in spotting plastics, plasters, and similar materials. Gages attached to frame can be set to pressure required. Working area of these presses is: table size, front to back, 12 in.; left to right, 19 in. Ram in open position is 11 in., in closed position, 1¾ n.

AceWeb Tool & Mfg Co, 4400 Stecker Ave, Dearborn, Mich

MORE DATA? Circle 80, inside back cover

Long-Type Small Wheel Grinders Have Speeds to 25,000 rpm

Series 922 pneumatic grinders developed especially for grinding into deep recesses and for two-hand operation, are furnished in 27 models with speeds from 12,000 to 25,000

rpm. The arbor or spindle, driven by swastika-type motor is independently mounted on two widely-spaced bearings, maintaining accurate alignment and permitting continuous heavy-duty small wheel grinding.

Choice of lever, pushbutton, and ring-throttle models is available. Six models are furnished with governors for work requiring constant speed and power.

Thomas C Wilson Inc, 21-11 44th Ave, Long Island City 1, NY

MORE DATA? Circle 81, inside back cover

Fan-Cooled Speed Reducers Include Line of Vertical Units

Vertical units added to company's line of fan-cooled worm gear speed reducers are available in nine sizes ranging from 3 to 12-in. center distances. Ratios extend from 4-1/7:1 to 95:1; ratings are fractional to 175 hp.

Features include one-piece finned housings; grease-lubricated gear shaft bearings with two fittings for each; oil seepage is prevented by incorporating a dry well around the output shaft and extending above the oil well.

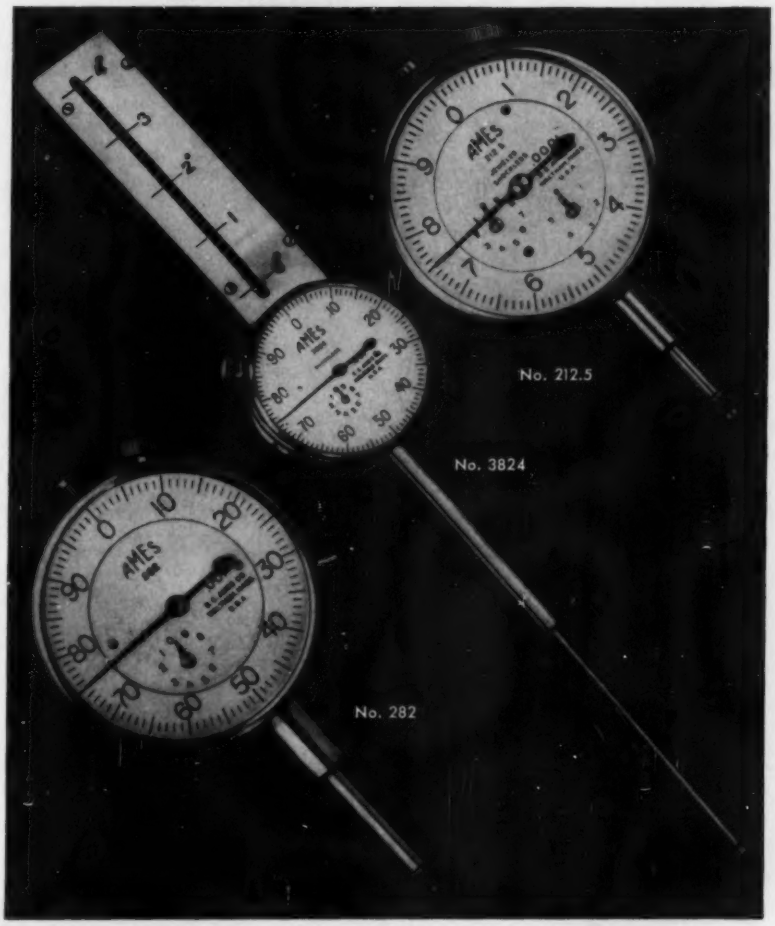
Cleveland Worm & Gear Div, Eaton Mfg Co, 3300 E 80th St, Cleveland 4, Ohio

MORE DATA? Circle 82, inside back cover

ELECTROLYTIC GRINDING SPINDLES, Anocut line, are available for operation from 50 amp to 3000 amp. Large number and variety of these precision motorized and belt driven spindles are available for grinding at all amperages within this range—*Pope Machinery Corp, 261 River St, Haverhill, Mass*

MORE DATA? Circle 83, inside back cover

AMES *Masters of Measurement*



Long Range Dial Indicators

Use Them for Checking: long slide travel, large cams, deep recesses or other dimensions requiring indicator spindle travel up to 12".

Features Include: large diameter dials, widely spaced dial graduations, movable dials, replaceable contacts and count hands.

For literally hundreds of measuring, indicating and comparing operations, you'll find Ames standard and customized gauges and indicators unerringly accurate and amazingly durable . . . *You're asking for the best when you specify Ames!*

B. C. AMES CO. Waltham 54, Mass. Representatives in Principal Cities—In Canada, H. C. Burton Co., 166 Rebecca Street, Hamilton, Canada.

B. C. AMES CO.

MANUFACTURERS OF MICROMETER DIAL INDICATORS, DIAL GAUGES, ACCU-FLOW AIR GAGES, PORTABLE TRANSISTORIZED COMPARATORS

YOU ARE INVITED TO TAKE OUR FIVE-MINUTE COURSE IN COST REDUCTION PLANNING

R.S.V.P.
EMHART MFG. CO.
HUDSON DIVISION
HUDSON, N.Y.

EMHART

IN INVITING YOU TO TAKE OUR COURSE . . .

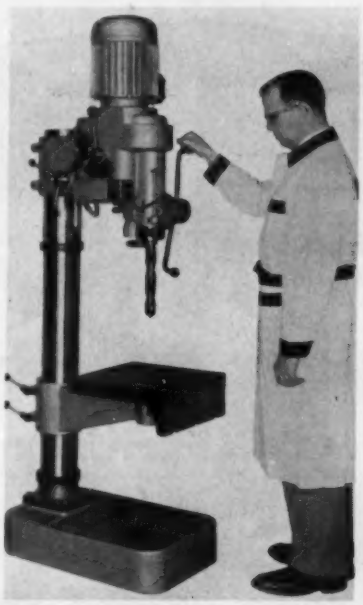
May we stress that, while we make precision V&O presses, feeds and automatic assembly machines, we are really in the business of helping you effect cost reductions in small parts production.

You can take our course by simply asking us to have the Emhart man in your area call on you. He is prepared to discuss cost reduction in the following areas . . .

1. PRODUCT DESIGN
2. MATERIAL AND PARTS FLOW
3. PACKAGING
4. FABRICATION
5. ASSEMBLY
6. DIRECT LABOR
7. INDIRECT LABOR
8. METHODS SIMPLIFICATION (People)
9. METHODS SIMPLIFICATION (Machines)
10. QUALITY CONTROL
11. IN-PROCESS INVENTORY
12. MAINTENANCE
13. FLOOR SPACE
14. SPARE PARTS INVENTORY (Customer)
15. SPARE PARTS INVENTORY (V & O Machines)
16. CRITICAL OPERATIONS

V & O
AUTOMATIC
PRESSES
AND FEEDS

CIRCLE 365 READER SERVICE CARD



Boice-Crane Drillpress Shifts Gears For Eight Spindle Speeds

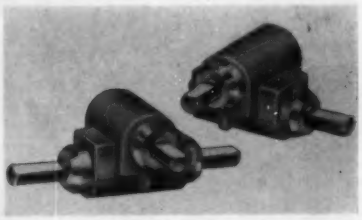
This Swedish-built, geared-head drillpress has a capacity of 1¾ in. in cast iron and 1½ in. in steel. A 2-speed motor that delivers 2½ hp at 1825 rpm drives the spindle and, coupled with a gear shift, makes eight spindle speeds from 60 to 900 rpm available.

Maximum spindle travel is 6 in. and the spindle will feed at three rates: 0.004, 0.008, and 0.012 in. per revolution.

Both the base and the working table have ground working surfaces, T-slots, and a coolant trough. Clearance from the spindle nose to the table is 25¾ in., and to the base, 39½ in.

Boice-Crane Co, 935 Central Ave, Toledo 6, Ohio

MORE DATA? Circle 84, inside back cover

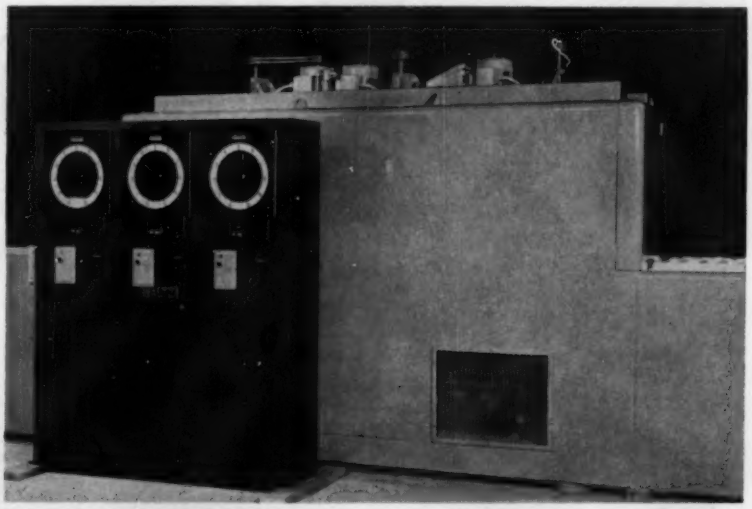


Angle Drives Furnished in Gear Ratio of 1:1, 1:2, 1:3

The 9056HF (T-drive) and 9056-119 (right angle drive) are provided with ¼-in. dia shafts cut to a 1/16-in. flat to provide stronger attachment to coupling ends. Primarily for use with flexible shafting, they are also adaptable to many other applications. Ultimate static torque capacity is 25 lb-in. with a backlash of 6°. Weight is 4 oz and 3½ oz respectively.

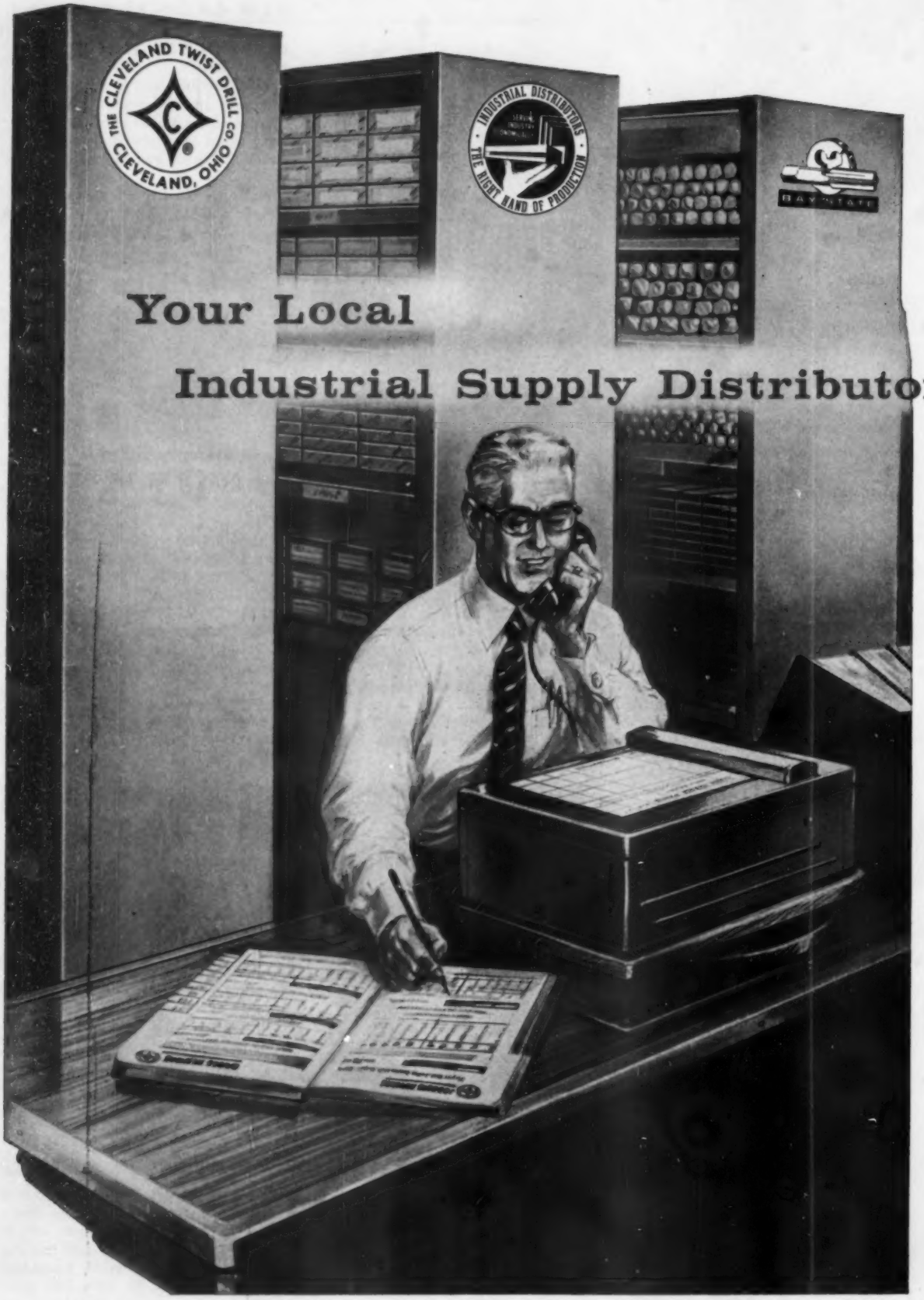
F W Stewart Corp, 4311 Ravenswood Ave, Chicago 13, Ill

MORE DATA? Circle 85, inside back cover



SPECIAL DRAWING FURNACE has automatic pushers for loading and unloading three work baskets, each 24 x 36 x 12 in. By push button control, the doors on each end of furnace open and pusher advances the baskets. A timer, adjustable from 5 to 120 min, blows a horn or flashes a light when individual heating cycles are completed—*Waltz Furnace Co, Dept 1, 1901 Symmes St, Cincinnati 6, Ohio*

MORE DATA? Circle 86, inside back cover


THE CLEVELAND TWIST DRILL CO.
CLEVELAND, OHIO
INDUSTRIAL DISTRIBUTORS
THE RIGHT HAND OF PRODUCTION
BAY STATE
Your Local
Industrial Supply Distributor

gives you GREATER VALUE

Value Added by Distribution is a major part of "Teamwork Tooling"*

Your Industrial Supply Distributor performs the essential marketing functions with efficiency and economy, adding immeasurable value to the tools by making them available to you when you need them.

With one local call you can get prompt delivery of many items, saving costly shut-downs. Your Distributor also saves you money on storage space . . . inventory cost . . . accounting.

Today more than ever before, when you are faced with a profit squeeze, it pays to "Telephone Your Industrial Distributor".

*"Teamwork Tooling" combines the talents of your Industrial Supply Distributor . . . our Stockroom Managers and Service Representatives . . . hundreds of engineering and production men in our plants . . . and even our own suppliers—all working together to help you reduce costs. You can rely on our "Tooling Team" for *highest total value!*

THE CLEVELAND TWIST DRILL CO., Cleveland 1, Ohio

BAY STATE TAP AND DIE CO., Mansfield, Mass.
Subsidiary of The Cleveland Twist Drill Co.

QUALITY CUTTING TOOLS • BEST SERVICE THROUGH YOUR LOCAL DISTRIBUTOR

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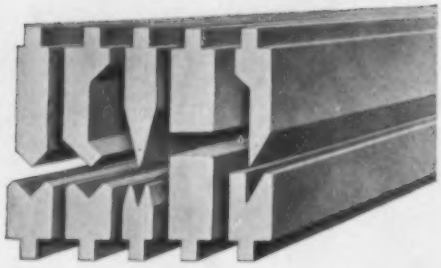
press brake tooling



Standard Type PRESS BRAKE DIES

62 different sizes and styles • Most in stock for off-the-shelf delivery

CHICAGO standard type press brake dies are used for a large variety of bending operations in any make or size of standard press brake. They are economical, and the quick delivery saves time in tooling up. Available in any length from 4 to 12 feet in increments of 2 feet; *induction hardened* or Diekrome steel.

The local distributors listed below offer immediate delivery on many sizes and styles of standard type CHICAGO press brake dies. If you have Bulletin STD-959 you can order any standard type die by number. Why not ask your nearest distributor for a copy? Also, if your requirements call for special multibend and forming dies, he can tell you about Dreis & Krump complete tooling service for any make of press brake.

Call your nearest distributor

ALABAMA
Birmingham
Hinkle Supply Co., Inc.
FAirfax 2-4541

CALIFORNIA
Los Angeles
Meyer Sheet Metal Mchry. Co.
MAdison 2-1477
San Francisco
Tay-Holbrook, Inc.
MArket 1-6800

GEORGIA
Atlanta
Allison Mchry. Co.
JAckson 4-1741

INDIANA
Indianapolis
E. L. Hunston Co., Inc.
WAlnut 5-9681

IOWA
Bonaparte
Corry's Machine & Tool—Phone: 112

KANSAS
Wichita
Elifeldt Mchry. & Supply Co.
AMherst 7-9773

MASSACHUSETTS
Cambridge
Austin-Hastings Co., Inc.
Kirkland 7-4480

MICHIGAN
Detroit
J. Lee Hackett Co.—TRinity 2-6442
Grand Rapids
Wing and Jabaay—CHerry 1-2125

MINNESOTA
Duluth
Girard Steel Supply Co.
MArket 8-1001
Minneapolis
Minnesota Steel & Mchry. Co.
FEderal 3-6273
St. Paul
Girard Steel Supply Co.
Midway 6-8635

MISSOURI
Kansas City
Elifeldt Mchry. & Supply Co.
Victor 2-5494

NEW YORK
New York
Federal Machinery Corp.
CAnal 6-3022
H. Weiss & Co.
CAnal 6-4256

NORTH CAROLINA
Greensboro
Armentrout Mchry. Co.
Phone: 4-8218

OHIO
Cleveland
T. R. Wigglesworth Mchry., Inc.
BEdford 2-2660
Columbus
Vorys Brothers, Inc.
AXminster 4-4701
Toledo
The Jack H. Ruth Co.
CHerry 3-2196

OKLAHOMA
Oklahoma City
Hart Industrial Supply Co.
REgent 9-2541
Tulsa
Hart Industrial Supply Co.
LUther 3-2175

OREGON
Portland
Hallidie Machinery Co., Inc.
ATlantic 2-2244

PENNSYLVANIA
Philadelphia
Delaware Valley Mchry., Inc.
OLdfield 9-4600
Milton Equipment Co.
WAlnut 2-1734
Pittsburgh
Wm. K. Stamets Co.
ATlantic 1-8091

TEXAS
Dallas
Briggs-Weaver Mchry. Co.
LAkeside 8-0311
Fort Worth
Briggs-Weaver Mchry. Co.
EDison 6-5621
Houston
Mehl Machinery, Inc.
FAirfax 3-1313

WASHINGTON
Seattle
Hallidie Machinery Co., Inc.
PArkway 3-9520

WISCONSIN
Milwaukee
Production Equipment, Inc.
GReenfield 6-6075

CANADA
A. R. Williams Mchry. Co., Ltd.

ALBERTA
Calgary—CH 3-7656
Edmonton—GE 9-4935

BRITISH COLUMBIA
Vancouver—MUtual 4-9411
Victoria—Phone: 4-7623

MANITOBA
Winnipeg—SUnset 3-1702

NEW BRUNSWICK
Moncton—EVergreen 2-0049

ONTARIO
Hamilton—LIberty 9-8420
Ottawa—CEntral 3-4900
Toronto—RUssell 7-0521
Windsor—CLearwater 4-4762

QUEBEC
Montreal—Riverside 8-9381

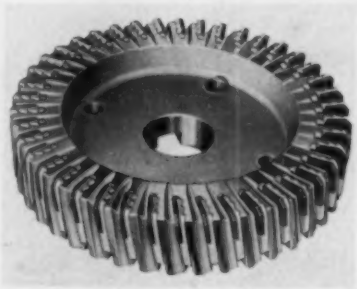
999

A Tradition of Quality and Value since 1899

Press Brakes • Press Brake Dies
Hand and Power Bending Brakes
Special Metal-Forming Machines

CHICAGO DREIS & KRUMP

DREIS & KRUMP MANUFACTURING CO.
7434 S. Loomis Blvd., Chicago 36, Illinois



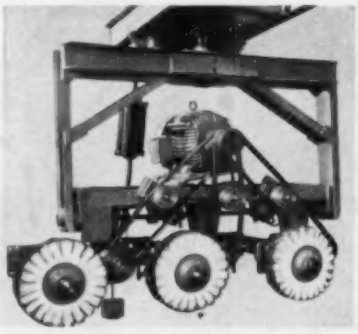
High-Speed Milling Cutters Perform Roughing or Finishing

Series 7100 Rigidcut face mill permits drastic reductions in machining time in cast-iron-milling operations where high cutting speed and feed are required. Not only can processing be done faster, but the shape of the brazed-carbide cutter blade permits either roughing or finishing actions, depending on adjustment.

Heavy high-speed cutting is achieved by the use of large blades with a generous chamfer on the end. Because the corner angle on the fine-pitch blades used in these cutters is ⅜ in. by 45°, cutters should be used on fairly heavy cuts—up to 5/16 in. For finishing, the ⅜-in. face of the blades can be ground, either to be free-cutting or to provide a surface with an extra fine finish. These cutters are available with effective diameters from 6 to 20 in. in 1-in. increments. All are furnished with a standard Wesson drive; those over 8 in. in dia can also be furnished with National Standard Drive.

Wesson Co, 1220 Woodward Heights Blvd, Ferndale 20, Mich

MORE DATA? Circle 87, inside back cover



Three-Wheel Suspended Workhead Buffs Hard-to-Reach Areas

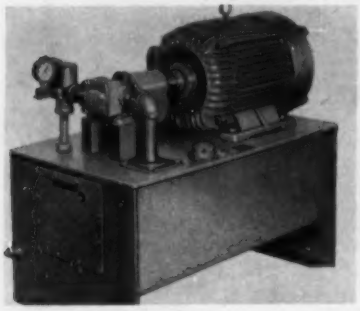
Workhead employs three buffing wheels driven by a single motor and is suspended from a mobile overhead carriage. Each wheel floats independently of the others and verti-

cal positioning of the complete head is handled by a screw and nut arrangement on the hanging column.

The unit may be ordered with either individual or unison wheel wear adjustment, controlled either manually or by automatic pushbutton. Uniform work pressures are maintained either by individual air cylinders or by the company's completely automatic torsion balancing unit.

Murray-Way Corp, PO Box 180, Birmingham, Mich

MORE DATA? Circle 88, inside back cover



Single Pump Hydraulic Power Units Have Pump Capacities to 35 gpm

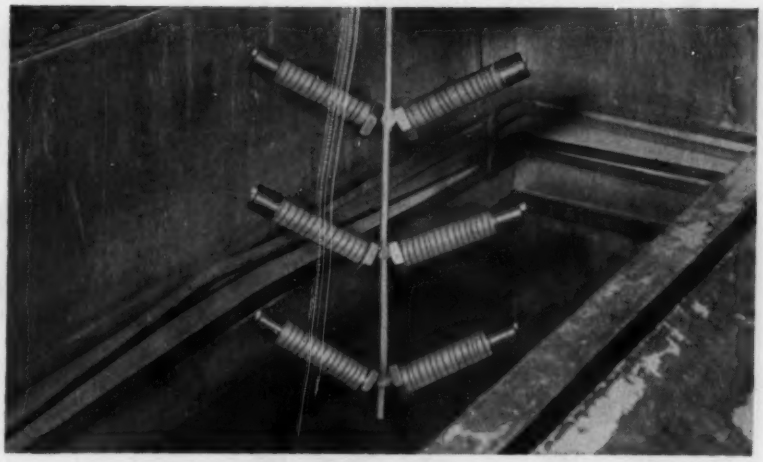
Line of 1000 and 2000-psi units features working capacity conversion. To meet possible increased power requirements after purchase, 11 of 13 Hannifin VSP units may be converted to 2000 psi units by installing a motor of additional horsepower. Total of 13 models are offered with reservoir capacities from 15 to 60 gal. All standard units are equipped with a separate relief valve and incorporate an 1800-rpm motor.

Hannifin Co, Dept 518, 501 S Wolf Rd, Des Plaines, Ill

MORE DATA? Circle 89, inside back cover

SHEET METAL CLAMP, the WNHL-SD, is a temporary fastener that eliminates the wedge-type action of conventional clamps. Available in size ranges for holes up to ¼-in. and for 1-in. thickness of material, and with wing, hex, or bar nut—*Monogram Precision Industries Inc, 8531 Higuera St, Culver City, Calif*

MORE DATA? Circle 90, inside back cover



mask simple shapes or complex contours

plating solutions can't creep under these tight-sticking

TAPES FROM 3M

Stop-off masking and rack wrapping are fast, easy, sure when you choose tapes from 3M for the job. "Scotch" Brand Electroplating Tape No. 470, developed especially for plating applications, is strong, conformable and has a backing that resists effects of most solutions.

Other electroplating tapes too: one that's extremely thin, tough, transparent; another backed with lead foil for use where "thieving" action is required.

TRY THIS METHOD. Ask your 3M Representative or nearest "Scotch" Brand Tape Distributor for a demonstration, or write: 3M Co., 900 Bush Ave., St. Paul 6, Minn., Dept. IBA-51

SCOTCH BRAND tapes for industry

Minnesota Mining and Manufacturing Company

...WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

"SCOTCH" IS A REGISTERED TRADEMARK OF 3M CO., ST. PAUL 6, MINN.

Thompson's exclusive "CYBERMATIC PENDANT CONTROL" completely eliminates the elevating hand wheel

All vertical movement of the wheel head, both automatic and manual, on this modern Thompson 36 x 48 x 72 Type CX Plunge-Matic Grinder is accomplished effortlessly by dials on the Cybermatic Pendant Control.

This new pendant control performs the following functions: **Sets automatic down feed from .0002" to .006" in .0002" increments—sets the total amount of automatic down feed for stock removal from 0 to 1 inch through the entire 48" vertical capacity—controls automatic down feed increment (as pre-selected) at each reversal of the wheel head on cross feed or at each table reversal on straight plunge feed — controls a 20" per minute rapid traverse to the elevation of the wheel head—provides a push button to re-set the down feed range at operator's will — pre-sets a wheel dressing increment for automatic wheel trueing—compensates manually or automatically for wheel dressing —provides a master stop button for all movement.**

This Thompson machine is completely modern in every respect. Its features include the exclusive Thompson Hydra-Cool Hydraulic System with dual packless cylinders providing automatic cushioning. A separate automatic lubrication system for all sliding way bearings and tape bed way covers are standard equipment.

This modern Thompson grinder is both high powered and extremely accurate.

Further specifications will be furnished upon request.

PRE-LOADED
SELF-ADJUSTING
COLD RUNNING
ROTATIONALLY STABLE
VIBRATIONLESS
FREE FROM WEAR

Thompson has taken another important step toward the ultimate in accuracy and precision by obtaining the exclusive use of the world famous MALCUS BLOCK BEARINGS for their wheel head spindles. The notable advantages of these bearings are listed above.

Thompson SURFACE GRINDERS

THE THOMPSON GRINDER COMPANY • SPRINGFIELD, OHIO

"Keep Thompson in mind for that daily grind"

Industrial Arc Welder Has Stepless Control Of Current

Heavy duty industrial arc welders, designated MCM-AC Bumblebee S Series, have a mechanically-operated moving coil for stepless control of welding current. The units come in 300 and 500 amp sizes and have a 60% duty-cycle rating.

Instant arc starting and arc stability are obtained from 80-volt open current. Optional features include a primary switch, voltage reducer, and primary contactor with 115-volt push-button-set control transformer.

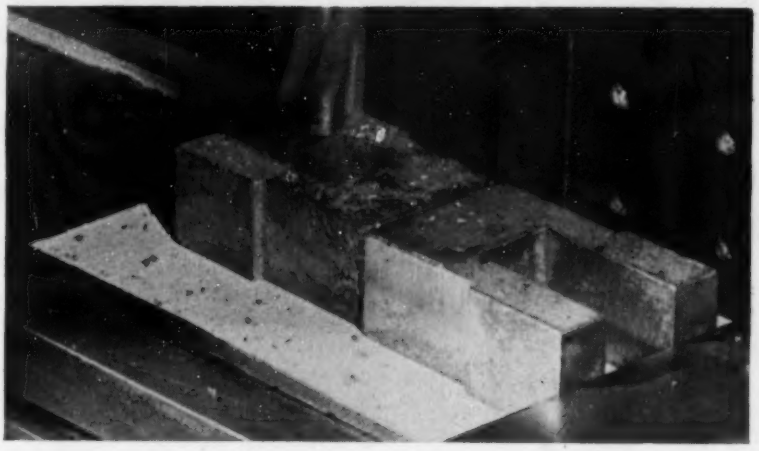
Air Reduction Co, Inc, 150 East 42 St, New York, NY

MORE DATA? Circle 91, inside back cover

DIAL INDICATOR MOUNTING for use on fixture gages is produced as a standard part making it possible to use an adjustable bracket-back indicator mounting at a cost comparable to that of a regular indicator back. Mounting assembly is available in height increments of 1/64 in. from heights of ¾ to 2½ in.—*Unigage Corp, 330 Interstate Rd, Addison, Ill*

MORE DATA? Circle 92, inside back cover

holds any metal like a magnet!



lock down nonferrous metals for milling with double-coated

TAPES FROM 3M

Keep nonferrous or small, hard-to-clamp parts where you want them during machining and finishing operations. "Scotch" Brand Double-Coated Tape goes on quickly . . . holds tight even under a flood of cutting fluid. This "tape that sticks on both sides" speeds such operations as cutting, grinding, milling and polishing.

TRY THIS METHOD. Ask your nearest "Scotch" Brand Tape Distributor to demonstrate this and the many other "Scotch" Brand Tapes for masking, surface protection, and metal finishing. Or, write: 3M Co., 900 Bush Ave., St. Paul 6, Minn. Dept. IBA-51

SCOTCH BRAND
tapes for industry

Minnesota Mining and Manufacturing Company
. . . WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

"SCOTCH" IS A REGISTERED TRADEMARK OF 3M CO., ST. PAUL 6, MINN.

Check SPECIALS Easily with This New Universal Staging Fixture

There's a new Universal Staging Fixture to position just about *any* part up to 3 inches in length. Mount the part and see the sharp image on the distortion-free 10-inch screen.

So easy, unskilled help can learn it in less than half a day. Other big savings, too . . . extremely low purchase price, *plus* almost unlimited versatility. With your choice of understage and surface illumination, and the new Universal Staging Fixtures, you can just about write off special jigs and fixtures as a cost factor.

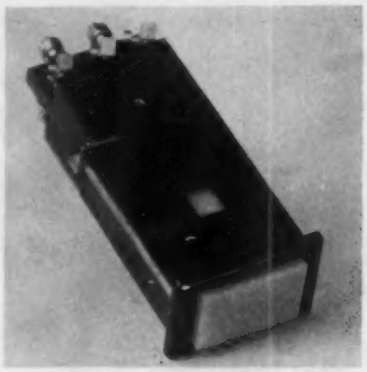
Find out more about how B&L can simplify your precision inspection. There's a complete line of instruments to help you. Mail the coupon now.

BAUSCH & LOMB INCORPORATED
61817 Bausch St., Rochester 2, N. Y.
Please send literature on:

- ☐ Bench Comparator, D-297
- ☐ Universal Staging Fixture, D-2007
- ☐ Toolmakers' Microscope
- ☐ StereoZoom Microscopes, D-15
- ☐ Scratch Depth Gage, D-2004
- ☐ Optical Aids, D-1059

NAME .....
COMPANY .....
ADDRESS .....
CITY ..... ZONE ..... STATE .....

BAUSCH & LOMB



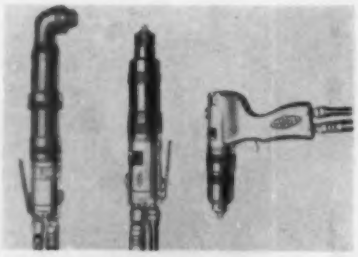
Pushbutton Switches Offered for Momentary or Alternate Action

Snap action pushbutton switches, available in both illuminated and non-illuminated versions, are of one-piece construction and furnished in either momentary or alternate action configurations. Design eliminates the need for external accessories.

Mounting arrangement allows unusual rigidity in virtually any panel thickness. Available configurations include 1 or 2 SPDT switches with ratings of 5 amp at 220 v ac and 0.25 amp at 220 v dc. All switches are rated at one million operations. Prices range from $7.55 to $9.00 in unit quantities.

Truco Engrg Co, 195 W Main St, Avon, Conn

MORE DATA? Circle 93, inside back cover



Air-Driven Assembly Tools Have Interchangeable Parts

Handles, motors, gear cases, and clutches are interchangeable on new line of Sioux air-powered drills, screwdrivers, and nut runners. Any one of the subassemblies can be quickly changed to convert a tool to a different need. Of the many possible combinations, one pistol handle, lever handle, and angle screwdriver, nut runner, and drill have been designated as catalog tools. These nine drills, screwdrivers, and nut runners are expected to cover most common applications.

Three motors are available, single

rotation (RH), single rotation (LH), and reversible. Built-in speed control for maximum to zero is by slotted head valve in the center of the main valve. Direction of rotation in reversible units is controlled by turning the knurled knob; changing direction does not disturb the speed setting. Direct, positive, and adjustable clutches are available.

Albertson & Co, Sioux City 2, Iowa

MORE DATA? Circle 94, inside back cover

Line of Reamer Bushings Has Full Floating Feature

Line has been developed to provide greater accuracy for stub screw machine reamers. New design corrects for misalignment: out-of-parallelism of turret and spindle, indexing inaccuracies, and even runout of hole in workpiece. The bushings enable closer tolerances to be held—only the reamer floats. In addition to greater reaming accuracy, machine setup time is reduced.

These reamer bushings in a good floating holder are claimed to be capable of reaming accurate holes under the most adverse conditions. They are available to take all stub screw machine reamer sizes.

Mueller Industries, 510 E Rand Rd, Mt Prospect, Ill

MORE DATA? Circle 95, inside back cover

VIBRATION PROBE, velocity type, with a moving weight of 0.1 g, has an output of 6mv/in/sec with a 40-ohm coil free to travel in excess of 3/16 in. double amplitude. It is ready for use by feeding the output directly to a high gain scope — *Dynamic Devices, Dayton, Ohio*

MORE DATA? Circle 96, inside back cover

trim the cost of trim painting!

fast and fancy finishing when you use masking

TAPES FROM 3M

The Harley-Davidson Motor Co. chooses masking tapes from 3M to speed much of the decorative trim painting on their products. Curved surfaces . . . complicated designs . . . the need for perfect results make "Scotch" Brand Masking Tapes especially desirable. These tapes from 3M conform easily . . . stick at a touch . . . remove cleanly and easily . . . leave no adhesive residue.

TRY THIS METHOD. See how it speeds finishing operations and improves results. Ask your 3M Representative or nearest "Scotch" Brand Tape Distributor for a demonstration, or write: 3M Co., 900 Bush Ave., St. Paul 6, Minn., Dept. IBA-51

SCOTCH BRAND tapes for industry

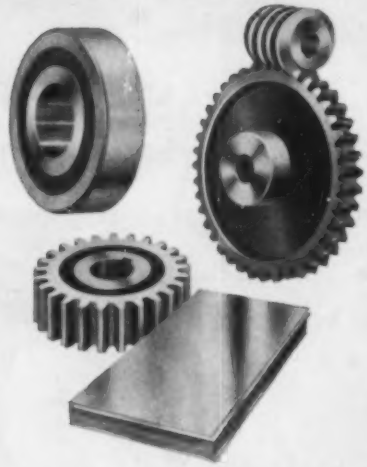
Minnesota Mining and Manufacturing Company

. . . WHERE RESEARCH IS THE KEY TO TOMORROW

"SCOTCH" IS A REGISTERED TRADEMARK OF 3M CO., ST. PAUL 6, MINN.

VALVOLINE
Tectyl

KEEPS METAL SURFACES FREE FROM RUST



There's a job for Valvoline Tectyl in your industry, protecting metal surfaces against rust and corrosion during shipping and storage.

Low-cost Tectyl rust preventives are widely used by the military services and by industry.

Tectyl's easy-to-apply, easy-to-remove film provides complete protection from the effects of snow, rain, perspiration, humidity, salt air, and corrosive fumes.

There is a Tectyl product for every need, with more than 40 variations of three principal types: oil-type, solvent cut-back and hot dip. Brush on, spray on or immerse. *We suggest you write today for your copies of two helpful, detailed Tectyl charts which give industrial and government specifications and applications.*

VALVOLINE
Tectyl RUST PREVENTIVES

VALVOLINE OIL COMPANY
A Division of Ashland Oil & Refining Company
Refinery — Freedom, Pennsylvania • Sales Office — Ashland, Kentucky

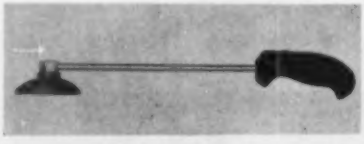
Chain Block Conveyor Designed For Oscillating Belt Grinder

Grinding a surface on a piece of practically any shape can now be done on a Tri-Matic oscillating belt grinder by using a new chain block conveyor that is easily fixtured. The conveyor drive can be arranged to reciprocate, providing, in effect, a surface grinder that grinds the full width of the table in one pass.

The fixtures can be bolted to the chain blocks, located on pins, against stops, or in a number of other ways. The solid base provided by the chain blocks is claimed to make it possible to hold extremely close tolerances comparable to a surface grinder. The chain blocks can also be covered with neoprene or other material and operated as an endless conveyor for grinding, polishing, and buffing flat parts and sheets.

Sales Service Mfg Co, 2363 University Ave, St Paul 14, Minn

MORE DATA? Circle 97, inside back cover



Manual Vacuum Lifter Handles Non-Porous Parts

Extension tubing of this vacuum lifter is securely locked into the pistol-grip neoprene handle. Pick-up and release are controlled by a flap in the handle which is operated by thumb pressure. It is especialy useful for punchpress operators in parts feeding or for material-handling equipment personnel in stock handling, and can be used by an operator wearing safety gloves.

The lifters are available in 12, 15, and 18-in. lengths and are equipped with 2¼ and 3⅛-in. replaceable neoprene vacuum cups.

Stilson Tool Inc, 30233 Groesbeck Hwy, Roseville, Mich

MORE DATA? Circle 98, inside back cover

Heller

Spiral cut

HALF ROUND

FILES

TAKE THE GAMBLE OUT OF SELLING! Push the Heller Line of files — plus die steel, hack saws and band saws. Your customers are being pre-sold month after month by the national advertising of America's oldest file manufacturer.

THE TWIST THAT SELLS

ROLLING ACTION IS BUILT IN! Perfect smooth arcs come naturally with Heller Spiral Half Round Files. No need for rolling action. It's built in by Heller's Spiral Cut. Grooving is prevented.

20% MORE TEETH AT WORK! The exclusive spiral cut of Heller Half Round Files brings more teeth to bear on the surface than any other file of comparable size.

LASTS LONGER! Spiral Cut Half Round Heller Files — with exclusive indented over-cut — multiplies width of upcut teeth three times . . . makes files last longer.

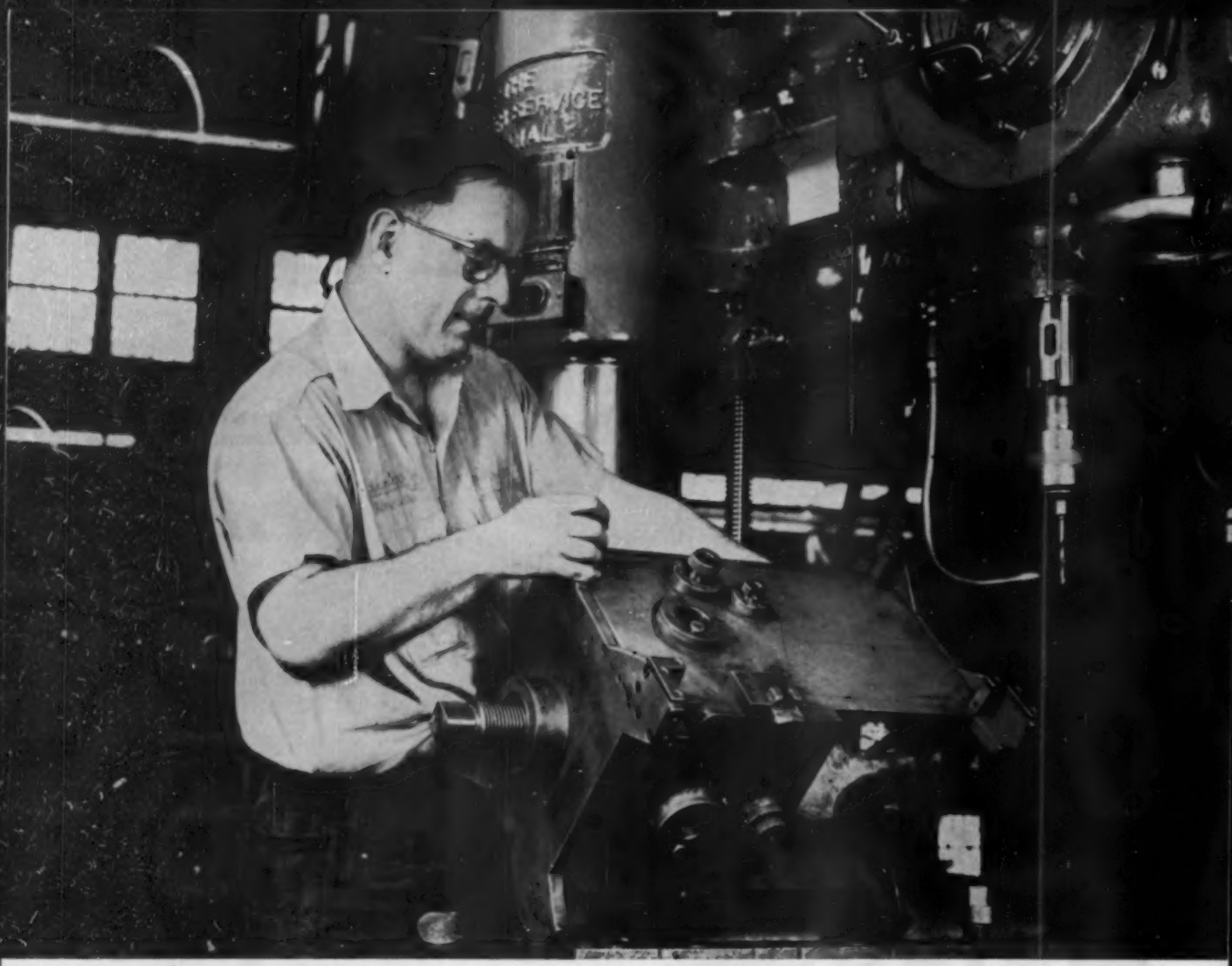
ONLY HELLER HAS "WAVY" TEETH ON FLAT SIDE! A patented Heller design — combining coarse, medium and fine teeth — provides maximum cutting power . . . speeds work . . . smooths cutting.

17-6-1

HELLER TOOL CO.
Our 125th year 1836-1961

America's Oldest File Manufacturer
NEWCOMERSTOWN, OHIO
Subsidiary of Simonds Saw and Steel Co.

Branch Offices and Warehouses: Union, N. J. • Detroit • Chicago • Shreveport • Los Angeles • San Francisco • Portland, Oregon



MAGNESIUM JIG CUTS COST OF DRILLING CASTINGS $3.08 PER UNIT!

By using magnesium tooling plate in place of steel, Worthington Corporation reduced the weight of tumble drill jigs from 125 pounds to 35 pounds. Used for close-tolerance drilling of castings, the magnesium jig can be turned by hand instead of by a chain hoist required for the heavier steel jig. This means a saving of $3.08 on every casting processed through the jig. And fabrication cost of the magnesium jig is 60% less than that of a steel jig.

Magnesium tooling plate can result in savings in your production operations. Its lightness, flatness, machinability and dimensional stability are ideal for fabricating accurate, easy-to-use jigs, fixtures, templates, gages, and for other tooling uses. For more information, write THE DOW METAL PRODUCTS COMPANY, Merchandising Dept. 1103F5-15, Midland, Michigan.

DOW **THE DOW METAL PRODUCTS COMPANY**
Division of The Dow Chemical Company

DOW

GET FAST DELIVERY OF MAGNESIUM TOOLING PLATE FROM THESE DISTRIBUTORS

Baltimore, Maryland
Clendenin Bros., Inc.
EAstern 7-4500
Charlotte, North Carolina
Hubbell Metals Inc.
EDison 4-5385
Chicago, Illinois
Fullerton Metals Co.
MErrimac 7-2700
Cleveland, Ohio
Copper and Brass Sales, Inc.
VUlcan 3-8100
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Joseph T. Ryerson & Son, Inc.
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Copper and Brass Sales, Inc.
FOrest 6-6200
Grand Rapids, Michigan
Copper and Brass Sales, Inc.
EMpire 1-6681
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Fullerton Metals Co.
TUxedo 8-8424
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Hubbell Metals Inc.
STate 7-1341
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Hubbell Metals Inc.
BAltimore 1-7760
Louisville, Kentucky
Hubbell Metals Inc.
MElrose 7-2595
Los Angeles, California
Reliance Magnesium Company
LUdlow 3-6361
Lyndhurst, New Jersey
A. R. Purdy Co., Inc.
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WHitehall 8-1661
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HUmboldt 1-6900
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Portland, Oregon
Eagle Metals, Inc. of Oregon
ATlantic 8-5201
St. Louis, Missouri
Hubbell Metals Inc.
FRanklin 1-0212
Seattle, Washington
Eagle Metals Company
PArkway 3-9974
Spokane, Washington
Eagle Metals Company
KEystone 4-0586

THE DOW METAL PRODUCTS COMPANY

DOW

Wintriss Electronic Controls Protect Automatic Machinery

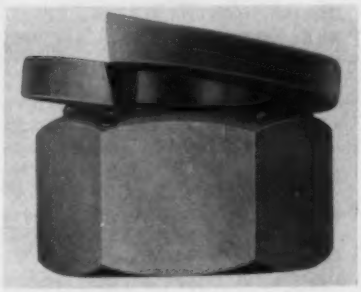
This Malfunction Detector automatically stops a molding machine from applying clamping pressure when protruding objects are lodged in the molds, when dies are misaligned, when the tie rods and guide ways lack lubrication, and when die pins tighten. The self adjusting control can be installed without changes in existing equipment and will automaticaly compensate for temperature, mechanical, and speed changes. Indicators allow an operator to monitor the proper closing of each corner of a die as well as any increase in hydraulic cylinder pressure.

• Similar to the malfunction detector, the Autotransfer protects any or all stations of a slide transfer machine by detecting faulty parts transfer in the die and stopping the press before an overload occurs. This unit also compensates for mechanical, temperature and voltage changes in the slide transfer.

• Companion to the two above controls is the missing parts detector which detects non-ejection, misfeeding, buckling, end-of-material, and overloading on automatic machinery and stops the machinery instantly. High impedence feeler assembly that is not affected by water or oil does the missing part detection.

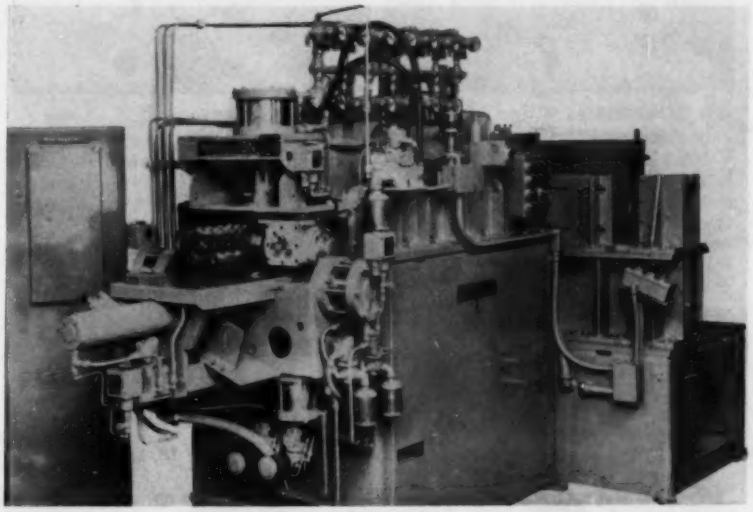
Wintriss Controls, Div of Industrionics Controls, Inc, 2024 Vandam St, New York 13, NY

MORE DATA? Circle 99, inside back cover



PREASSEMBLED HEX NUT and helical spring washer, called Nups, is available in 5/16 and 3/8-in. sizes, fine and coarse threads, plain and plated finishes—*Philadelphia Steel & Wire Corp, Penn St and Belfield Ave, Philadephia 44, Pa*

MORE DATA? Circle 100, inside back cover



PRECISION AUTOMATIC MASH SEAM WELDER for welding electric motor shells includes a 200 KVA transformer, magazine feed, transfer, rolling mill, and stripper mechanism. Machine takes a stack of slotted steel blanks, rolls them into cylinders, welds them to exact circumference, and ejects them at a rate of 420 an hr—*Precision Welder and Flexopress Corp, Cincinnati, Ohio*

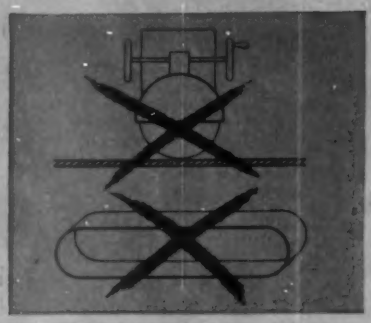
MORE DATA? Circle 101, inside back cover

Aluminum Problems?

See how the LAPMASTER can lick 'em...

CLAMPING ELIMINATED. Aluminum, magnesium and all non-ferrous metals can't take clamping without warp or distortion. The Lapmaster eliminates this serious problem because flat surfaces are lapped in a free, unclamped state. Flatness checks show that the Lapmaster *consistently* produces surfaces to extremely close tolerances . . . even irregularly shaped parts, like those above, pass the most rigid inspection for flatness.

"AS-CAST" WARPAGE REMOVED FAST. Lapmasters quickly rectify "as-cast" warpage on flat surfaces of non-ferrous metal parts. Lapping produces the true, flat reference plane desired for subsequent machining. In other instances where parts become distorted due to clamping and chucking operations, a short, follow-up cycle on a Lapmaster will return the surfaces to their original flat condition.



GRINDING PROBLEMS VANISH. There is no such thing as "lap plate loading". If you've tried grinding or belt sanding aluminum or magnesium, you know how fast the wheels load . . . how difficult and costly it is to prevent surface gouging, ripping or tearing. But with the Lapmaster method of stock removal, you never face such problems. Instead, you get uniform accuracy and a scratch-free finish, piece-after-piece.

NO MORE BURRS. After lapping on a Lapmaster, burrs just don't exist. Finger testing proves it every time. Lapping eliminates the expense of subsequent hand deburring operations and helps reduce inspection costs. This advantage is especially important in the finishing of pump, compressor or engine parts or on parts incorporating "O" ring groove on the face.

FAST STOCK REMOVAL. Lapping of non-ferrous metals on a Lapmaster is a finishing method that saves time and money for hundreds of manufacturers. Stock removal rates are high. Other methods requiring expensive tooling still cannot match the accuracy of lapping. And Lapmasters do it right the first time, every time.

PERFECTLY MATED SURFACES. In many cases, Lapmasters eliminate difficult gasketing problems by lapping mating surfaces to microinch finishes of 2 to 3 AA, to flatness within one light band (.0000116") or less and parallelity of exacting tolerances. The Lapmaster, for example, produces mating surfaces on aluminum transmission parts that will hold oil at 200 psi. Its uniform accuracy also eliminates selective assembly.

Lapmaster®

. . . THE MACHINE THAT PUT PRECISION LAPPING ON A PRODUCTION BASIS

Write for the complete Lapmaster catalog of facts and money-saving ideas.

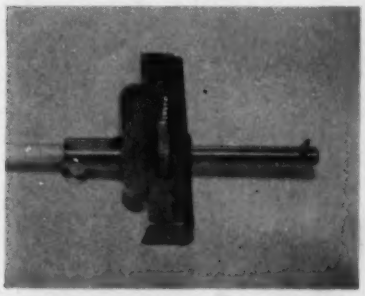
A product of

Crane Packing Company

6436 OAKTON STREET • MORTON GROVE, ILLINOIS (Chicago Suburb)

In Canada: Crane Packing Company, Ltd., Hamilton, Ont.

In England: Payne Products International, Slough Bucks.



Marking and Layout Tool Offered For Flat Surface Work

Model 360 is designed for laying out straight lines and circles on sheet metal and other flat surfaces. Main body is drilled and machined to hold the barrel and adjusting wheel; barrel is drilled and slotted to hold the marking rods which are of various lengths and can be quickly changed by lifting on the spring-loaded locking pin. Rods are slotted their full length and holes with ¼-in. spacings are provided for quick adjustments.

Fine adjustments are made by turning the adjusting wheel which has 16 threads per inch; one turn of the wheel equals 1/16 in. of travel. Four divisions are marked off on the wheel for fine adjustments. Trammel point is located at the back end of the main body and a separate set of graduations are provided for making circles. Graduations for straight markings are at the right side of the rod, those for circles on the left side.

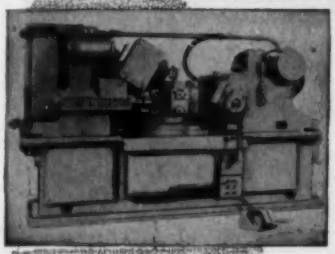
Inventions Future Inc, 918 Blackhawk Blvd, Rockton, Ill

MORE DATA? Circle 102, inside back cover

AIR GAGES, available in two models, have adjustable magnification from 35:1 to 28,000:1 with a choice of 26 stock dials — *Standard Gage Co, Poughkeepsie, NY*

MORE DATA? Circle 103, inside back cover

GOSS and DE LEEUW
AUTOMATIC CHUCKING MACHINE



means a complete piece... at each index cycle

When a piece is finished it is *completely* finished without the necessity of a second operation. Furthermore, it means *more* finished pieces in a given period of time and greater accuracy in *every* finished piece.

The "1-2-3" Method is exclusive with Goss & DeLeeuw. With it, three ends of a piece can be machined at a single chucking of the work, simultaneously or in sequence depending on the operations involved. It will pay you to investigate.

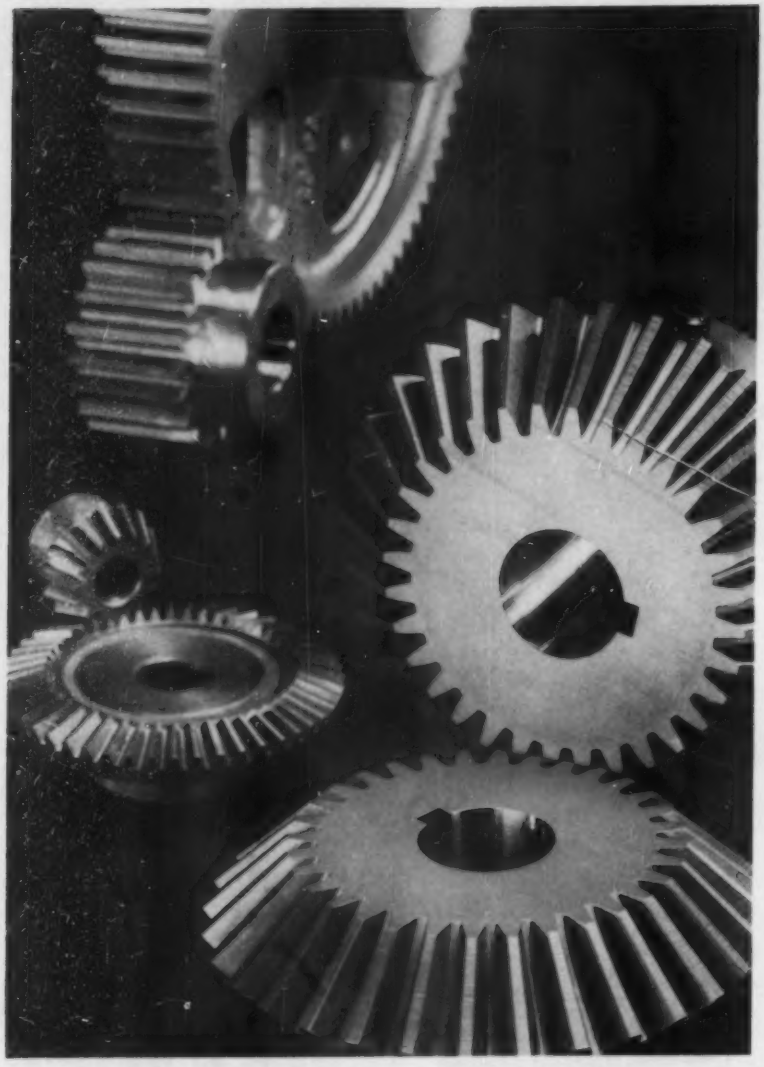
Send for illustrated literature giving detailed information. Send samples and ask us to give you cost estimates of handling this work on a "1-2-3" Goss & DeLeeuw Automatic Chucking Machine.

GOSS & DeLEEUW
PRODUCT QUALITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

BOSTON Gear QUALITY

largest selection
20° P.A. stock gears



Off-the-shelf delivery – from stock
at over 100 Distributors. Spur, bevel, miter.
782 types and sizes. 120 to 4 pitch.
Brass, steel, iron, and non-metallic.
Design around gears you can get today.
IN STOCK at your nearby **DISTRIBUTOR**

BOSTON Gear®

© Boston Gear Works, 1961
Quincy 71, Mass.

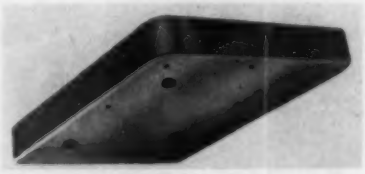
Power Unit Converts Standard Wheel To Electrolytic Grinder

Hi-Cut power converters make it possible to change any conventional grinder into an electrolytic grinder that will cut diamond and aluminum wheel costs up to 90% and increase grinding speeds from 3½ to 10 times, according to the manufacturer.

Smoother finishing, (between 5 and 12 micro-in. RMS) elimination of burrs, and protection against spot annealing are also claimed for the units, which come in five standard models with capacities from 250 to 1500 amp.

Hi-Carb Corp, 1055 East 260 St, Cleveland, Ohio

MORE DATA? Circle 104, inside back cover



Floating Air Platform For Jigs and Fixtures

Jig and fixture platform, called Mighty Midge Flying Carpet, floats work on a thin film of air. It is designed to be put under any jig or fixture which, when loaded, weighs over 20 lb. Because the work is floating when the operator lines up the cutting tool with the bushing, it is aligned more accurately and quickly. Air sweeping out from under the platform cleans away chips.

The device is an alloy-iron plate with many tiny orifices drilled in the

bottom. These control a metered amount of air, allowing it to flow in a predetermined pattern, thus lifting the load a few thousandths of an inch above the machine table. For some classes of work the plate is fastened to the machine table with the orifices facing up and the work is floated over it. Two sizes are available, 6 and 10 in. long; both are 5⅞ in. wide by 1⅛ in. thick. They can be used in any combination for large work.

Sperman Metal Specialties, 2199 E 21st St, Brooklyn 29, NY

MORE DATA? Circle 105, inside back cover

Anti-Tarnish Solution Reduces Cyanide Electroplating Stains

No-Tarn EC is a dry-salt mixture that is used in an aqueous solution to impart a high tarnish resistance to non-ferrous metals such as electroplated brass, copper, solid brass. The mixture, which is sold in 50, 100, and 150 lb lots, is also said to reduce the spotting-out and staining caused by cyanide solution electroplating.

Lea-Ronal, Inc, 130-19 180 St, Jamaica 34, NY

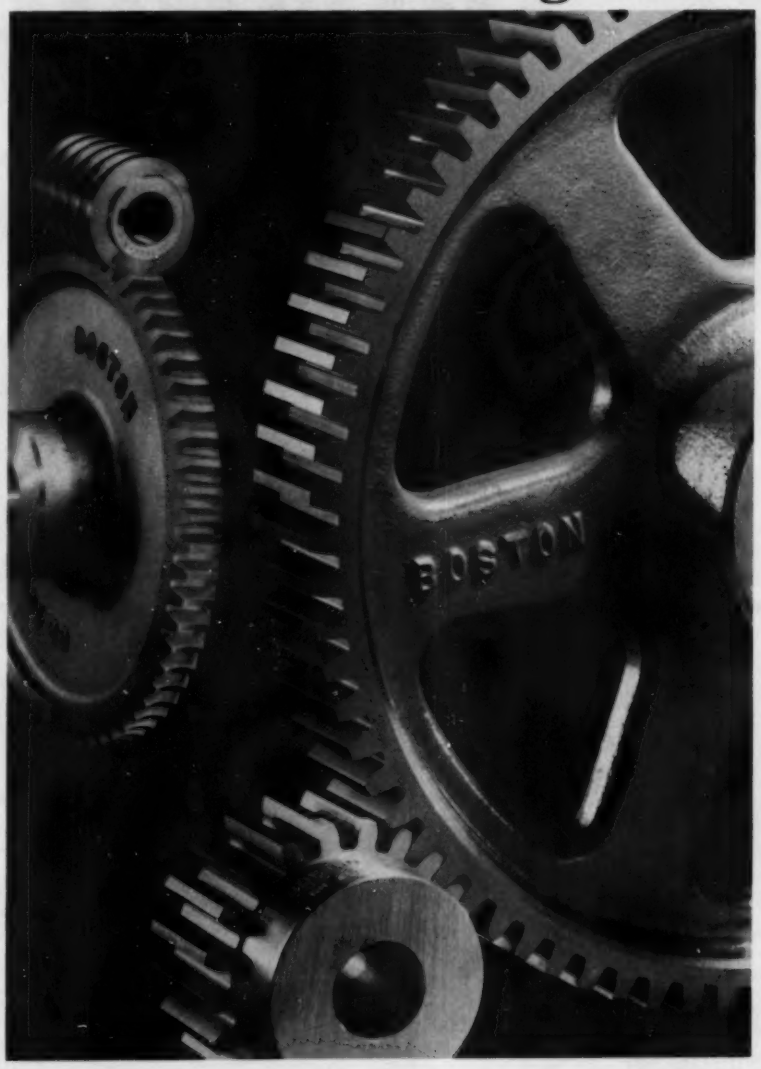
MORE DATA? Circle 106, inside back cover

POWERFUL MAGNET will pick up 3 lbs of loose nuts, bolts or small parts and will release them instantly when the plunger-handle is squeezed. It will also separate stacked metal sheets and lift large parts up to 30 lb. A heavier, 5 and 50 lb model is also available—*Magnetic Products Div, Jess Corp, 15770 Telegraph Rd, Detroit, Mich*

MORE DATA? Circle 107, inside back cover

BOSTON Gear® QUALITY

largest selection
14½° P.A. stock gears



From local stock - at factory prices

Spur, helical, worms and worm gears.
1781 types and sizes, from 48 to 3 pitch.
Brass, steel, iron, and non-metallic.
See Catalog 57 for complete listings.
IN STOCK at your nearby **DISTRIBUTOR**

BOSTON Gear®

© Boston Gear Works, 1961
Quincy 71, Mass.

10 COST REDUCING FEATURES OF Burgmaster

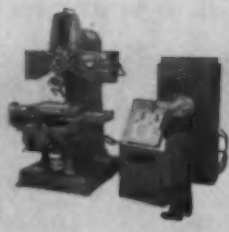
ACCURATE

RIGID

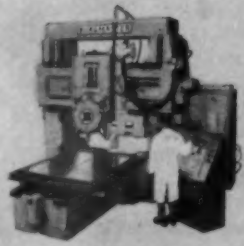
FAST

MODEL 3BHT
8-spindle, 1½" capacity in steel. Table travel 20 x 30, 30 x 45.

MODEL 2BHT
6-spindle, ¾" capacity in steel. Table travel 10 x 18, 15 x 26, 20 x 30.



BURGMASTER MODEL 25AHT
6-spindle, 1¼" capacity in steel. Table travel 15 x 26, 20 x 30, 30 x 45.



MODEL 3BHT-B DOUBLE HOUSING, PLANER TYPE
8-spindle, 1½" capacity in steel. Table travel 48 x 60.

TAPE-CONTROLLED

World's Largest Builder of Turret Drilling Machines

TURRET DRILLING MACHINES

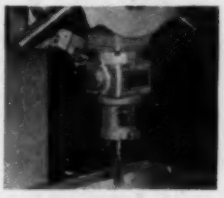
1 MACHINE RIGIDITY

Burgmaster components are well proportioned stable Moly Iron castings engineered with proper wall thickness, and extensive internal ribbing in the right places to provide the rigidity and stability required.

2 TURRET CLAMP RING

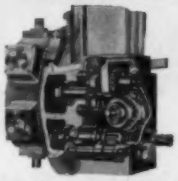
Increased accuracy is provided for heavy machining operations because turret is rigidly held against the face of the slide and securely clamped by an automatic acting "V" type external clamping ring.

3 LEAD SCREW TAPPER



The Burgmaster Lead Screw Tapping Head greatly improves the finish and accuracy of tapped threads and eliminates scrap due to pulled or loose threads. Capacities range from ¼" to 1⅛" in steel.

4 FOOL PROOF, ACCURATE TURRET INDEX

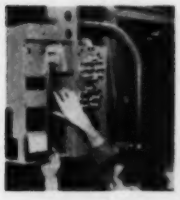


through Geneva mechanism with shot bolt locator and turret clamp assure .0004" TIR index accuracy one spindle to another.

5 RUGGED SPINDLES

mounted in sets of reloaded double and single row, ball bearings, or Timken Roller Bearings assure minimum runout (.0004" TIR max.).

6 CONTROL STATION MOUNTED DEPTH STOP DRUM

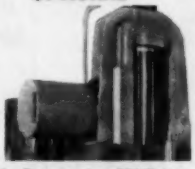


For setting depth stops and rapid traverse, lengths are located at the operator's control station within easy handling distance for convenience and speed in making set-ups. (60" from floor on 3BHT).

7 10 TAPE CONTROL SYSTEMS

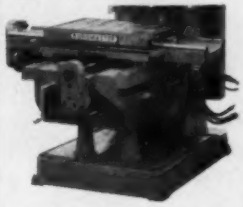
Ten different tape control systems are available with Burgmaster Turret Drills. This represents more systems than have been applied to any other drilling machines. In addition, more Burgmasters are tape controlled than any other type or make of machine.

8 MILL FUNCTION — RECIPROCATING DEEP HOLE DRILLING 3 AXIS CONTROL — OPTIONAL



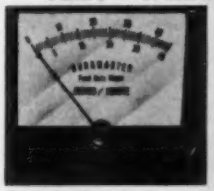
1. Burgmaster 3BHT tape controlled turret drills are rugged enough for milling cuts.
2. Reciprocating feed modification permits deep hole drilling with fine finish.
3. 3 axis tape control provides automatic depth control or circular table control — speeds setup, increases machine versatility.

9 HEAVY TABLE FULL WAY SUPPORT



Burgmaster tables are mounted on extra deep carriages, and the ways are twice the length of table travel in both X and Y motions with no table overhang. Tables are supported by double, synchronized, single crank operated, jack screws to eliminate deflection under load. Larger tables have four jacks.

10 PRE-SELECTIVE SPINDLE FEEDS — SPEEDS



Pre-selective feeds are infinitely variable from ¼" to 50" per minute, automatically pressure and temperature compensated which assures constant feed rates, as indicated on Feed Rate Meter at all times.

PRE-SELECTIVE SPEEDS

A wide range of 12, 24, or 32 speeds provide the right rate for most efficient machining and long tool life.

Burgmaster CORPORATION

15001 S. Figueroa Street, Gardena, California, FAculty 1-3510 DAvis 9-4158

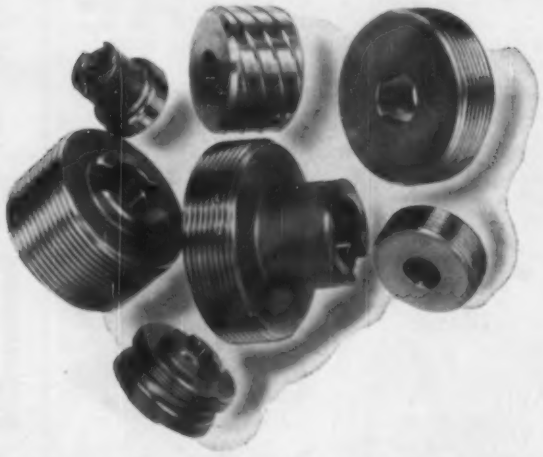
BURGMASTER DIRECT SALES OFFICES: Ridgewood, New Jersey, 86 North Maple Avenue., GIlbert 4-3002 • **Chicago 5, Illinois,** 4908 Lincoln Ave., LOng Beach 1-1178 • **Cleveland 7, Ohio,** 14706 Detroit Ave., ACademy 6-7030 • **Detroit 37, Michigan,** 13730 W. Eight Mile Road, LIncoln 8-4333 • **Northern California,** Castro Valley, JEfferson 7-1650 • **Kearney & Trecker, C.V.A. Ltd.,** Sole Agents for Great Britain, British Commonwealth and Western Europe.

SEND FOR LITERATURE

Write for bulletin describing Burgmaster 6 and 8 Spindle Tape Controlled Turret Drilling, Tapping and Boring Machines. Forty minute 16 mm sound film showing all Burgmaster Turret Drills in operation is available without charge from any office.

CIRCLE 383 READER SERVICE CARD

More Can Be Done



With Reed Thread Rolls!

Take full advantage of the possibilities illustrated above which thread and form rolling offer to reduce costs and improve quality. Thread rolling also can eliminate many secondary operations.

Reed, pioneer-leader in the development of all types of thread rolling equipment, supplies thread and form rolls for a wide variety of applications.

Reed Thread Rolls manufactured under rigid standards of quality control are uniform . . . durable . . . accurate, and available for all types and makes of holders. Over 150 standard sizes regularly stocked . . . plus non-standard rolls on special order.

REED

REED

ROLLED THREAD DIE CO.

Subsidiary of Union Twist Drill Company,
HOLDEN, MASSACHUSETTS
Specialists in Thread and Form Rolling Tools and Equipment

Refillable Aerosol Sprayer Offered in Electric Model

BVI Bantam Model VS-50 for manufacturing, maintenance, and service operations, is designed for spray-on applications of light oils, water, lubricants, rust inhibitors, sealers, coatings, adhesives. Unit is 6¼ in. tall, 2½ in. in dia, weighs 12 oz. It is ready to use after plugging in and is furnished with a 6-ft cord and polypropylene case. Corrosion-proof pump atomizes liquid into a fine, vapor-like mist. It permits the use of a clear-vision 4-oz jar instead of metal as required with pressure sprayers.

Burgess Vibrocrafters Inc, Commercial Products Div, Grayslake, Ill

MORE DATA? Circle 108, inside back cover

FHP Speed Reducers Furnished For Ratios to 100:1

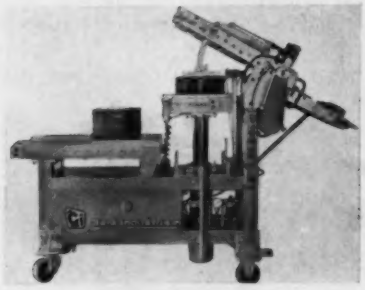
Type 2⅝A provides speed ratios from 5-4/5:1 up to 100:1, handling inputs of ¼ to 2 hp at 1800 rpm and 1/6 to 1½ hp at 1200 rpm. Right-angle drive, horizontal-worm-gear speed reduction unit is built for continuous duty in stokers, conveyors, agitators, spraying equipment, and a wide range of other applications. Fully enclosed, it may be mounted in any position.

These reversible speed reduction units may be furnished with input or output shafts projecting from

either side of the housing, or from both sides.

Abart Gear & Machine Co, Dept AM-3, 4834-36 W 16th St, Chicago 50, Ill

MORE DATA? Circle 109, inside back cover



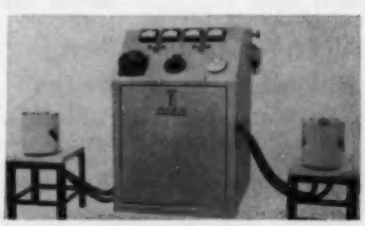
Automatic Flat Blank Feeder Features Magnetic Pick-Up

Feeder for handling flat metal blanks of any shape incorporates one-at-a-time magnetic pick-up from the top of the work stack; magnetic rolls and belt transfer the blank to the operating machine. Powered roller section is designed for receiving up to 18-in.-high stacks directly from a conveyor, lift truck, or crane. Hydraulic lift section automatically maintains stack level at pick-up and returns for new stack from roller section.

Models and sizes are available to handle blanks from 10 in. in dia to 30 in. sq, 0.015 to 0.125 in.-thick ferrous metal. Operating speeds are up to 100 parts per minute. These feeders are adaptable to any type of vertical or inclined press, shear, or brake.

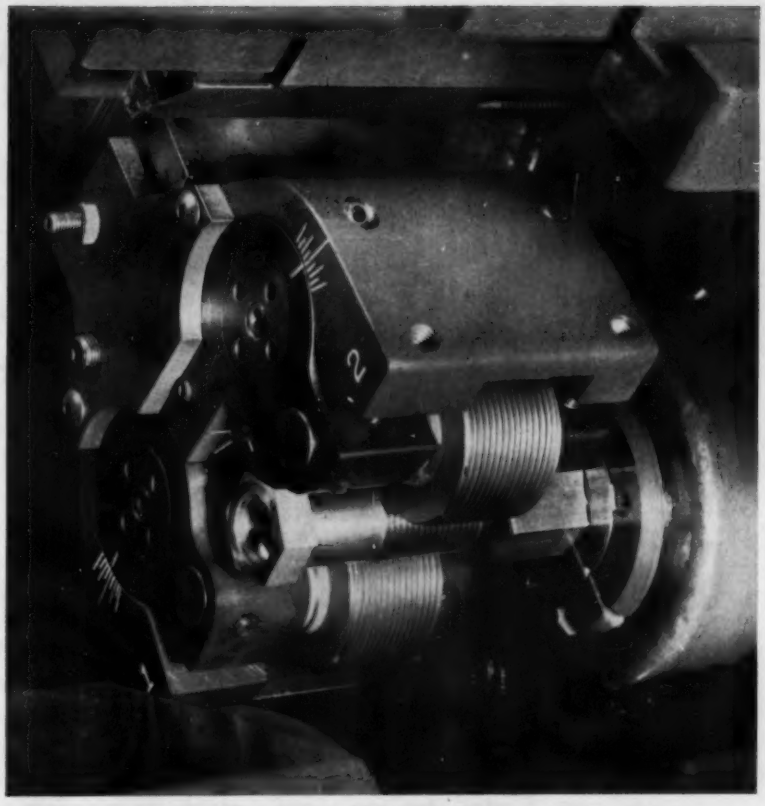
Clark Industries, Box 314, Delaware, Ohio

MORE DATA? Circle 110, inside back cover

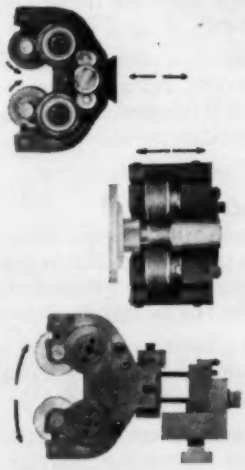


Power Control Unit Offered For Induction Melting Operations

The Inducto Integral 15 is a self-contained, 15-kw, motor-generator-powered control unit for high frequency induction heating and melting which potentially displaces 20-kw spark-gap converters for laboratory and low volume foundry production applications. Use of motor-generator power eliminates hy-



Reed Thread Rolling Attachments feature Self Compensating Roll Action



ADVANCE COMPENSATOR
- Eliminates Strain in Gear Train
- Permits Interchanging Rolls of Same Diameter
- Allows Either Roll to Contact Work Blank First

SIDE FLOATING COMPENSATOR
With New Anti-friction Bearing Unit
- Reduces Side Thrust on Rolls
- Permits Use of Standard Diameter Rolls under varying operating conditions

ALIGNMENT COMPENSATOR
- Provides parallel alignment of rolls during rolling
- Assures smooth contacting and withdrawal of rolls

Write for your copy of Thread Rolling Attachment Bulletin B-2 for helpful information on Thread and Form Rolling

REED ROLLED THREAD DIE CO.

Specialists in Thread and Form Rolling Tools and Equipment

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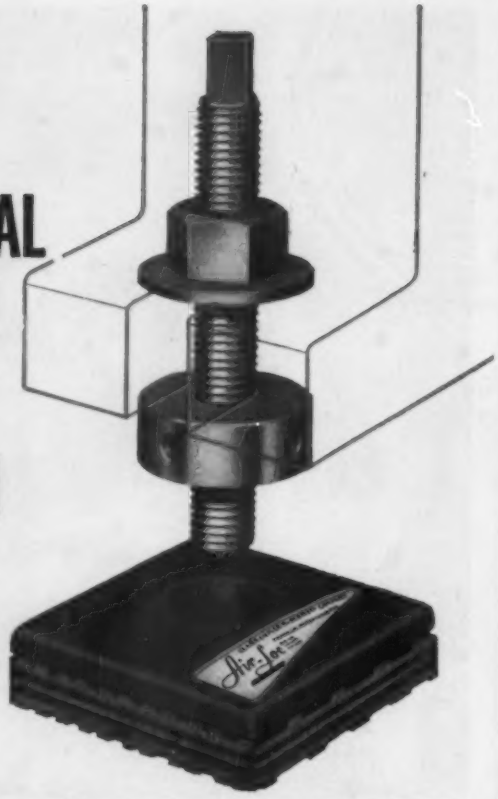
THE ECONOMICAL APPROACH TO VIBRATION CONTROL



JACMOUNT

MACHINE MOUNTS

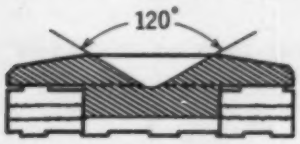
Jacmounts are designed for economy in machine mounts. While low in cost, they rate high in their ability to isolate shock and noise, and to dampen 85% or more of machine vibration.

Jacmounts are made in two units: a cast steel base plate — bonded to a heavy pad of shock absorbent Air-Loc®; and a jack screw assembly for accurate leveling. The base plate is recessed with a 1¼" diameter cone-shaped depression to accommodate the screw.

Jacmounts are easily installed, requiring no bolting or cementing.

BUY ONLY WHAT YOU NEED FOR YOUR MACHINES

Many machines already have jack screws furnished as original equipment. In this case, you buy only the base plate. Its conical recess has an included angle of 120° to take a wide range of screw diameters. If your machines are without jack screws, you buy the complete unit.



Conical recess will accommodate a wide range of screw diameters.

In either case, you'll get a mount of excellent stability and performance.

Jacmounts are adaptable to your mounting requirements. Call your local Air-Loc distributor now, or write for complete information.

Air-Loc® DIVISION

Clark, Cutler, McDermott Co.

100 WEST CENTRAL ST. • FRANKLIN, MASS.

drogen and radio shielding problems. In addition, furnaces or heating coils controlled by the unit operate at constant coil-voltages of 220 or 440 v compared with operating peaks up to 20,000 v of spark-gap units. This reduces arcing problems by 99%, allowing vacuum melting.

Inductotherm Corp, 412 Illinois Ave, Delanco, NJ

MORE DATA? Circle 111, inside back cover

Hydraulic Pumping Units Operate At Pressures up to 2500 psi

New Racine Junior Series, with flow rates from 0.6 to 4.2 gpm, are self-contained power units designed for a wide range of applications including lift trucks, small clamping mechanisms, gate valve operations.

Base forms the oil reservoir. Motor, pump, filler and breather assembly, and pressure and return connection are mounted on an assembly on an aluminum baseplate that forms the cover for the reservoir.

Racine Hydraulics & Machinery Inc, 2000 Albert St, Racine, Wis

MORE DATA? Circle 112, inside back cover

All-Position Electrodes Work With Reverse Polarity Welders

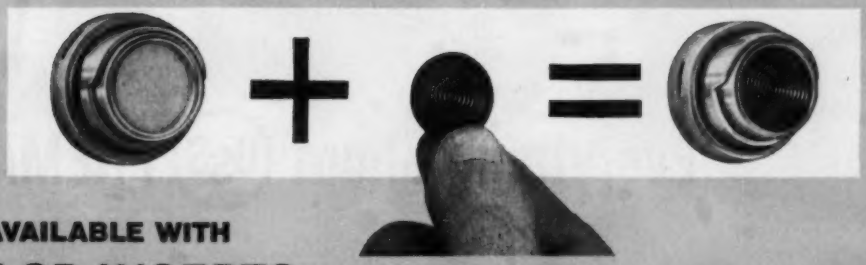
Iron-powder electrodes can be used in all positions with ac or dc reverse-polarity welding. Designated Speedex HTS, the improved class E-7018 low-hydrogen electrodes may be used to join low alloy high strength steels, hardenable steels, high carbon steels, high sulphur steels and enameling steels.

Mechanical properties of HTS as welded are; tensile strength, 79,000 psi, yield point 71,000 psi, elongation —2 in., 30%, and reduction in area, 70%.

Metal and Thermit Corp, General Offices, Rahway, NJ

MORE DATA? Circle 113, inside back cover

Square D's ALL-METAL Push Buttons give EXTRA DURABILITY!



NOW AVAILABLE WITH

COLOR INSERTS—with these Important Advantages:

Longer lasting • Indestructible operator is made entirely of metal. High-density polyethylene inserts are permanently colored, won't fade or deteriorate on even the toughest jobs. Push buttons are completely oil-tight, even when depressed.

Reduce your inventory • Order push buttons in color desired, or get the new "universal" package containing a basic operator and seven different color inserts—no extra cost. Inserts just snap in, can be changed in seconds if necessary.

7 colors available • Choose from black, red, green, brown, yellow, orange, blue.

Complete flexibility • Any operator can be used with any contact block to meet every requirement. Contact block arrangements include single-pole double-throw, two-pole double-throw, four-pole double-throw, sequence closing, and overlapping contacts.

A COMPLETE LINE OF OIL-TIGHT OPERATORS

Write for Bulletin 9001-T. Square D Company, Dept. SA, 4041 No. Richards St., Milwaukee 12, Wis.

SQUARE D COMPANY

wherever electricity is distributed and controlled

This mark tells you a product
is made of modern, dependable Steel.

Everything about USS FREMAX 45 is "Blue Chip"... except the chips

Here's a new, free-machining, flame hardening plate steel that combines all the qualities you want . . . at an attractive price. Before the introduction of USS FREMAX 45 Steel, limited quantities were field tested by a number of customers. Their results, as well as our own, have proven the superior machinability of this steel. Now USS FREMAX 45 Plate Steel has been made generally available.

By using USS FREMAX 45 Steel, Detroit Edge Tool Company's machinists were able to step up their normal milling feed rate of 2½" per minute to 3⅞" per minute, and increase their normal spindle speed of 144 RPM to 204 RPM while maintaining the same cutting depth. This resulted in a 50% increase in milling production with no burning or damage to the tools. The milling characteristics were excellent . . . as good as or better than other plates milled at far slower speeds, and no special tools or extra equipment were required. *You* may be able to gain the same benefits.

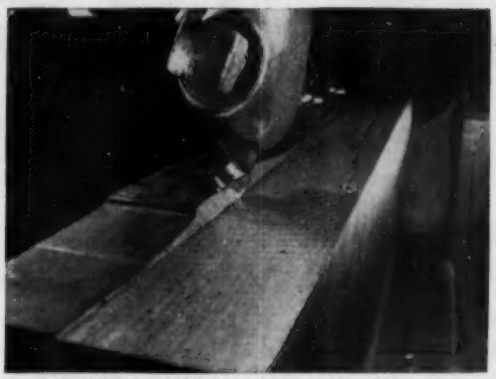
USS FREMAX 45 Steel performs equally well in other machining operations. It broaches without peeling; drills and taps clean; and heavy shaping cuts produce no blue chips. The plate grinds to a good finish with only normal wear to the abrasives.

Flame Hardening—The ability to flame harden makes USS FREMAX 45 Steel ideally suited for gears, sprockets, rings, cams, dies, wheels, rolls, and machine ways . . . or anything else that needs extra toughness and wear resistance. This flame hardening steel bridges the gap between low-carbon, free-machining steel and alloy machining steels. After machining, these plates were flame hardened by Detroit Flame Hardening Company. Their tests indicated that all surfaces had a Rockwell "C" hardness of 62 . . . and the dimensional stability was excellent.

USS FREMAX 45 is available from your local Steel Service Center or in mill quantities through USS District Sales Offices. For more information, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pa. USS and FREMAX are registered trademarks. United States Steel Corporation • American Steel & Wire Division • Columbia-Geneva Steel Division • National Tube Division • Tennessee Coal & Iron Division • United States Steel Supply Division • United States Steel Export Company

The excellent machining characteristics of USS FREMAX 45 Steel enabled Detroit Edge Tool Company to substantially increase their milling speed without burning or damaging the tools.

Photomacrograph of an etched cross-section of the flame hardened USS FREMAX 45 Steel Plate. The dark area shows the depth of penetration of the flame hardening.



Heavy shaping cuts of ¼ inch produced no blue chips.

Composition

	C	Mn	P	S	Si
Per Cent	.40/.50	.90/1.30	.040 max.	.20/.30	.15 max.

USS

United States Steel

INSPECTION PROJECTOR MAGNIFIES FOR ® QUALITY...

Our inspection projector magnifies cutting edges to eliminate the minute angular deflection that could cause you costly production losses . . . just one of many inspections that account for Circle R quality.

CIRCLE R saws, slitters and combination center drills must submit to constant exhaustive inspection to work their way to you. They've got to prove they can ensure you correct cutting angles, long service, and minimal downtime.

Consult these CIRCLE R Specialists . . .

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CEDAR RAPIDS — McNeil Tool & Supply Corp.
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CLEVELAND — Production Tool Co.
DAYTON — J. D. Harris Company
DETROIT — J. L. Bradford Associates
HACKENSACK — The Eaton Company
INDIANAPOLIS — Donald McIntire
MEMPHIS — Branch-Marvin Tool Specialties
MILWAUKEE — Ford Tool Company
MONTREAL — Humphrey D. Malone
NEW HYDE PARK — The Eaton Company
NEW YORK CITY — J. V. Cranmin (Export)
PHILADELPHIA — General Tool Sales Co.
PHOENIX — McDaniels Tool Center
PITTSBURGH — Ralph Esposito & Co.
PROVIDENCE — Fred J. Hodkinson
ROCHESTER — James O. Howe

CIRCULAR TOOL CO., INC.
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Specialists in Circular Cutting Tools Since 1923

METAL SLITTING SAWS • SLOTTED SLITTING SAWS • SCREW SLOTTING SAWS • COMMUTATOR SLOTTING SAWS • JEWELERS' SLOTTING SAWS • CUT OFF SAWS • CIRCULAR SHEAR BLADES • CIRCOLOY STEEL SAWS • SOLID & TIPPED TUNGSTEN CARBIDE SAWS • COMBINED DRILLS & COUNTERSINKS • CENTER REAMERS

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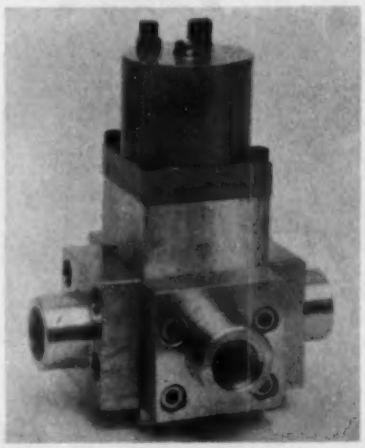
A precision product fully guaranteed for quality and performance by the Manufacturers of the CHANDLER DUPLEX Boring and Facing Tool Heads.

For Complete Details Write to:

CHANDLER TOOL CO., Muncie, Indiana

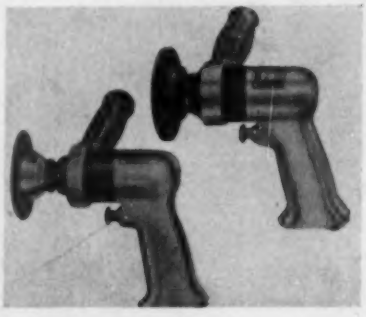


4-Way Directional Control Valve Features Very Low Pressure Drop

Spherotor "no leak" valves designed for use with oils and non-corrosive fluids or lubricated air, are available in ¼, ⅜, or ½-in. pipe sizes. These rotary units can be indexed by a Midget Rotac (made by Ex-Cell-O Corp of Greenville, Ohio); supplying shop air at 100 psi to the Rotac will provide sufficient torque to index the valve operating a 2000-psi hydraulic circuit, or a hydraulic pilot circuit.

Sarasota Precision Products Inc, 5757 McIntosh Rd, Sarasota, Fla

MORE DATA? Circle 114, inside back cover



Finishing Tools Feature Pistol Grip Control

Series 31V and 31S grinders and sanders incorporate an offset pistol grip handle that permits acurate one-hand control over general duty finishing operations. A removable and adjustable dead handle is furnished with each model for more difficult tasks.

The 31V-140 grinder (top) has a 3-in. wheel capacity. Exclusive of wheel, it is 5½ in. long, weighs 1⅞ lb, and its ⅜-in.—24 spindle turns at 18,000 rpm. Adapter for depressed center wheels is standard equipment. The 31S-140 sander has a 3-in. disk

hoover quality

...RACEWAYS HONED SMOOTHER THAN PLATE GLASS

It's easier to strike a match on plate glass than on the smooth surface of a Hoover bearing raceway. A special process, developed and used only by Hoover, hones raceways until they are ultra smooth, superbly finished. With both inner and outer raceways *Hoover Honed* to microscopic perfection, Hoover ball bearings have a distinctive quality advantage.

Equally important as the *Hoover Honed* raceways are carefully matched sets of *Micro-Velvet* balls which are accurate within millionths of an inch. These precision components work together in hushed quietness, an excellent indication of bearing quality and a characteristic of all Hoover bearings.

Outstanding quality—*Hoover Quality*—pays off in longer life, greater load capacity and superior bearing performance in a wide range of applications.

Hoover Honed and *Micro-Velvet* are Hoover Trademarks

hoover

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Zone Sales Offices and Warehouses | 8581 South Chicago Ave., Chicago 17, Illinois
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2020 South Figueroa, Los Angeles 7, California

hoover CONTROLS *hoover quality* FROM START TO FINISH

Hoover's Cuyahoga Steel and Wire Division produces quality chrome alloy steel wire from which balls are made.

Micro-Velvet balls are products of Hoover Ball Division plants in Middletown, Ohio, and Erwin, Tennessee.

Non-destructive electronic testing devices check bearing parts for tolerance, hardness and hidden flaws.

Hoover bearings in a wide range of types and sizes always measure up to high *Hoover Quality* standards.

DO THE JOB
FASTER,
BETTER,
CHEAPER!

ACF-ERCO AUTOMATIC PUNCH RIVETERS

are from 4 to 11 times faster than any other fastening tool or technique • liberate up to 80% of existing manpower • eliminate diework and related handling operations • reduce rejects to an absolute minimum • improve strength, uniformity and consistency of joints • increase product quality and sales appeal.

Lightweight (25 lb.), portable model punches holes, places and heads flush- or round-head rivets in less than 2 seconds total cycle time • standard pneumatically-powered line achieves speeds up to 45 rivets per minute • "One Man-One Machine" operation means man-hour economies as high as 90%.

For specifications, free brochures or inquiries, write:
ERCO Machine Tools, ACF ELECTRONICS DIVISION, Riverdale, Maryland

ELECTRONICS DIVISION

ACF INDUSTRIES

See the full line in action at the ASTME show at Booth #1623, New York Coliseum, May 22-26th.

capacity, is 6¼ in. long, weighs 2 lb, and operates at 20,000 rpm. A clamping washer and adapter are standard equipment.

Buckeye Tools Corp, 5003 Springboro Pike, Dayton 1, Ohio

MORE DATA? Circle 115, inside back cover

Glazed Surface Finish Lets Saws Cut Faster and Reduces Seizing

Mirror-like finish on these high speed saws is said to give free cutting action without seizing even in stringy materals. The glazed finished permits use of less concavity in the surface, thereby stiffening the saw section for more accurate cuts.

Redesigned tooth geometry reportedly increases saw life up to 4 times that of normal saws between sharpenings. Type 606C slitting saw is available in 18 sizes from 2½ to 6 in. dia.

Browne & Sharpe Mfg Co, Providence, RI

MORE DATA? Circle 116, inside back cover

Spray-on Fluoro-carbon Compound Is Lubricant, Anti-Stick Agent

Addition of a non-toxic film bonding agent to Flouro-Glide has made this flouro lubricant and anti-stick agent available to general industry. Previously distributed only in pure grade for laboratory use, the aerosol-dispensed lubricant is recommended for submerged bearings, woven belts, cam followers, ball and socket and rotary joints and precision bearings.

As an anti-stick agent it can be applied to tanks, vats, conveyor belts, gaskets, molds, and dies. Flouro-Glide is said to have exceptional performance at extreme temperatures (cryogenic to +500F) and under severely corrosive conditions.

Chemplast, Inc, 3 Central Ave, East Newark, NJ •

MORE DATA? Circle 117, inside back cover

Maxitorq
Disc-pac

THE *Prepackaged* CLUTCH OR BRAKE ASSEMBLY

Takes performance guesswork out of power transmission design

With these performance-proved units, you can save time and money in designing and building clutches and brakes exactly tailored to the requirements of your application. At the same time, you can be sure that they will equal the performance and smooth operation of proved MAXITORQ clutches and brakes. DISC-PACS are simply the "heart" of a clutch or brake... the discs, separator springs, and locking plate... supplied as a complete self-contained unit for the convenience of design engineers and equipment builders.

Produced in a full range of sizes and capacities from ¼ h.p. to 15 h.p. Bulletins available on other MAXITORQ products: Floating Disc clutches and brakes, Electric clutches, Overload Release clutches, low-cost Single Disc clutches, and clutch or brake friction discs. Write Dept. AM

THE CARLYLE JOHNSON MACHINE CO.
MANCHESTER, CONNECTICUT
3CJ80

Buffalo machine tools offer many advantages which enable you to reduce production costs. Here are four machines designed to expedite metalworking operations. Chances are one or more of them should be working for you right now!

Fight Rising Production Costs with 'Buffalo' Machine Tools

Here is a rugged precision drill with instant fingertip spindle speed control from 90 to 10,000 RPM. Capacities to 2".

Here's an optional special hollow spindle to permit use of advanced type bits in drilling exotic metals and ceramics.

Here is all-geared power feed for effortless, precision drilling. Here is nickel steel ball bearing backgearing to further increase your range of operations and freedom from troubles.

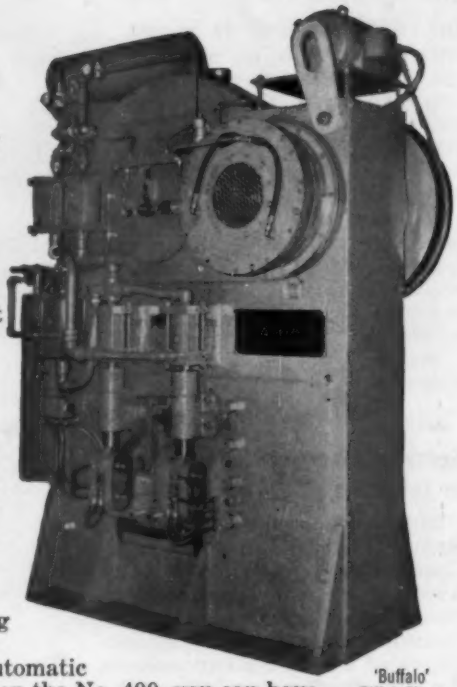
Here are setup adjustments of the greatest convenience — table raising screws and ground, polished ways.

Here's a table of ample size to handle any and all of your work.

In short, here's one machine of a complete line that's ready, willing and able to do more drilling jobs better and for less — to put you out front in the race against costs!

Have your 'Buffalo' Machine Tool Dealer fill you in on all the details.

Faster Cleaner Billet Shearing Than Ever Before!

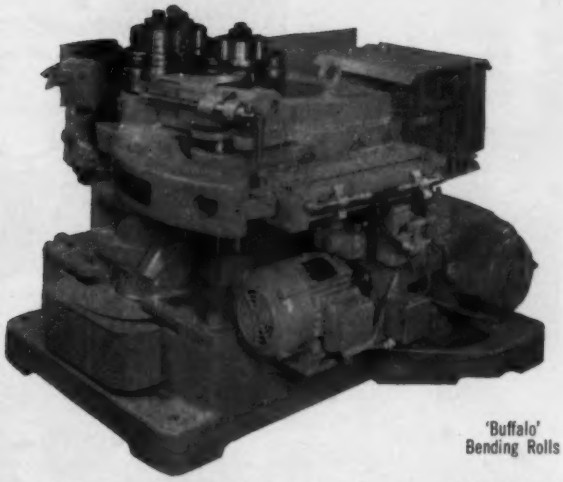

'Buffalo' Billet Shear

You get clean, square-cut billets for the best possible finished forgings — and at lower cost — per-cut with new 'Buffalo' Billet Shear. By automating with an optional automatic feed table on the No. 400, you can have up to 18,000 cuts per 8-hour shift.

These shear-fractured cuts have no smears to conceal porosity, as with sawing or burning. Quality control is greatly enhanced.

'Buffalo' Billet Shears have frames of heavy alloy plate. Lubrication is by trouble-free automatic pneumatic oiling system. Controls are electrical.

Your 'Buffalo' Machine Tool Dealer will be happy to give you full details, including capacities. Or write us direct.



'Buffalo'
Bending Rolls

Continuous Cold-Bending Without Dies!

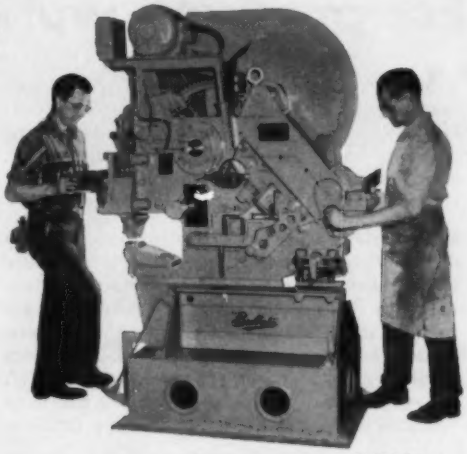
Here's high-speed, commercially accurate bending of tees, angles, beams, flats, pipe and tubing into arcs, segments and spirals. One pass does the trick. No heat, no dies required — it's all done by standard or special rolls to fit any structurals you wish to bend. Rings formed at production speeds by rolling spirals, cutting to length and butt-welding.

'Buffalo' Bending Rolls are built for a lifetime of profitable metal bending . . . in sizes from the lightest Aircraft Types to models for bridge builders and other heavy fabricators. There is no cheaper way to bend structurals. Ask your nearby 'Buffalo' Machine Tool Dealer !

7 Fabrication Operations on One High-Speed Machine!

In the race against high fabrication costs, don't overlook the 'Buffalo' Universal Iron Worker, the most useful machine in the shop ! Taking only the floor space of one machine, it cuts — punches — shears — slits — copes — notches — miters — without tool changes ! The U. I. W. does two operations at once — handles your angles, tees, beams, channels and bars in jig time — pays off in maintenance and straight production work — in all your fabrication jobs ! No shop ever bought a U. I W. that didn't pay for itself in a few short months in all-around usefulness. Investigate the U. I. W. today for the lowest-cost method of handling any fabrication — maintenance jobs in the shortest possible time, in the smallest floor space !

Have your 'Buffalo' Machine Tool Man join you in your fight for greater profits. Phone or write today.



'Buffalo'
Universal Iron Worker

MACHINE TOOL DIVISION

BUFFALO FORGE COMPANY

Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

Operator reads table position direct from dial without troublesome calculations.
Scale readings, projected through a 22-power lens system, show legibly on brightly illuminated dial.
Hardened stainless steel precision scale* with each graduation numbered.
(Half Actual Size)

New optical measuring instrument...

For precision work to .0002"

The new VERNAC direct reading optical measuring instrument indicates longitudinal, lateral or vertical position of the table of any machine tool without benefit of mechanical connections. It can be incorporated in new equipment or tools already in service.

HOW IT OPERATES: Readings from a precision scale, affixed to the machine tool table, are transmitted through a 22-power lens system onto an illuminated, highly visible, direct-reading dial. Readings are in .025" intervals. A double spiral reticle on the dial provides further measurement refinement to .0001". All readings are complete within the dial area eliminating reference to an outside pointer.

*The scale is a replica of a master certified by the U.S. National Bureau of Standards to .0001" maximum error over its entire length.

- No moving parts
- Easy to read and operate
- All readings on one dial
- Accuracy not affected by wear of table screws
- Eliminates gauge blocks, end rods

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UNITED STATES AND FOREIGN PATENTS

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New York, May 22-26

SIMPSON OPTICAL MANUFACTURING CO., 3202-06 Carroll Ave., Chicago 24, Ill.

Manufacturers and designers of precision optics for scientific equipment since 1926.

TOOL SHOW IN PRINT

(continued from page 186)

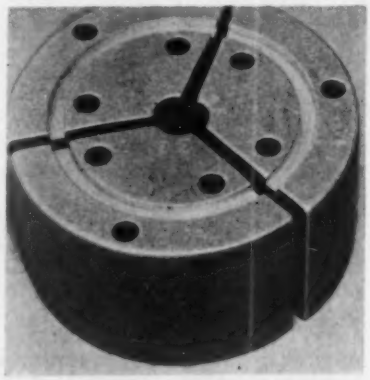
Producto Hand Tapping Machine Reduces Thread Lead Distortion

Model VT-1 hand tapping machine permits an operator to swing a tap to any point on the table, or beyond the table if large parts or fixtures overhang, and guide the tap into true hole center with its counterbalanced arm.

According to the manufacturer, the machine requires less tapping torque, reduces thread lead distortion, produces straight tapped holes.

Toolroom Equipment Div, The Producto Machine Co, 990 Housatonic Ave, Bridgeport 1, Conn

MORE DATA? Circle 237, inside back cover



10-in. Aluminum Pie Jaws Fit AS or Serrated Key-Type Chucks

This standard set of 10-in. pie jaws, made of aluminum alloy, is available for both American Standard or serrated key-type chucks. They can be ordered to fit any chuck size from 6 to 28 in.

The special aluminum alloy used for the jaws allows them to be easily machined yet to retain enough interest strength to grip a heavy forging for machining.

Siewek Tool Co, 2862 E Grand Blvd, Detroit 2, Mich

MORE DATA? Circle 238, inside back cover

SERIES M FRICTION CLUTCH OBI

what customers like most about Niagara's new OBI line

Already in the field and on the job in substantial numbers, the new Series M is drawing a very significant response from production people. Here, briefly, are the features generating the most comment:

EXTRA RUGGED, NEW WELDED STEEL FRAME . . . surpasses in stiffness even the high standards by which Niagara OBI's have been known for years. Dramatically less vertical and angular deflection prolongs die life, assures uniformity of work.

FULLY ENCLOSED DRIVE . . . improves safety factor by eliminating exposed rotating parts. Front guard shields operator from oil splashes.

COMPACT BUILT-IN PRESS CONTROL . . . assembled with the latest in compact components. Nothing protrudes.

SLOW, LOW ENERGY, POWER-OFF JOGGING . . . When in "Jog" position, the Selector Switch *disconnects main motor*. Pressing 2 palm buttons (both hands) brings slide down slowly and smoothly. A separate motor jog button permits small shots of energy to be restored to flywheel as required. Die-setting is easier, faster, safer.

EXTRA LONG, RIGID SLIDE . . . prevents deflection of guiding ways. Exceptionally generous front-to-back mounting space, with mounting holes in front, rear, and sides, gives dies more solid support. New design provides for circulating oil and keeps oil out of die area.

Niagara Series M OBI Presses are available in 4 sizes (both non-geared and single geared) with shaft diameters from 2½" to 4" and capacities from 22 to 60 tons. A specialized design is built for automatic ultra high speed production. For the full story, send today for Bulletin 54. Niagara Machine & Tool Works, Buffalo 11, N. Y. District Offices and Distributors Everywhere.

NIAGARA

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.

CIRCLE 399 READER SERVICE CARD

HOW KAISER BENDS ALUMINUM CONDUIT ELBOWS...at low cost!

Low-cost volume forming of conduit elbows by the Kaiser Aluminum & Chemical Corporation at their Dolton, Illinois, plant has been important to their attainment of a leading position in the production of aluminum electrical conduit. Conduit and elbows are produced in 13 standard sizes ranging from ½" to 6" I.P.S. A single, versatile Pines Model 3 Bending Machine handles the ten standard conduit sizes from ½" to 4" . . . producing smooth 90° elbows with speed and accuracy.

The conduit elbows are bent without the use of mandrels, keeping tool costs low. Even without mandrels, there is no distortion of pre-threaded ends and flattening is held well within the limits set up by the Underwriters Laboratories Code. Production of smaller size elbows is increased up to 75% by bending two at a time on stacked tools.

Find out now how the speed and versatility of Pines Bending Machines can help you produce better quality products that cost less.

WRITE TODAY FOR COMPLETE CATALOG AND CASE STUDY REPORTS

'61

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery

672 WALNUT ST. • AURORA, ILL.

TOOL SHOW IN PRINT

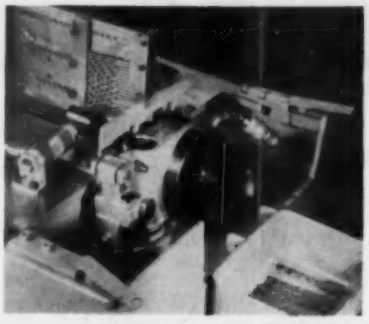
Accurate Bushing Shows Line of Clamp Assemblies, Fixture Parts

Handles, knobs, wheels, spring plungers, and torque screws are among over 1000 items in company's new line of clamping assemblies and fixture components. They are said to make a more complete purchasing package when the purchaser wants to buy from one factory source in order to minimize purchasing costs.

In addition, the firm is introducing machined cast iron sections which are supposed to save time and money in both design and fabrication of jigs and fixtures and in many drilling and milling applications. Short runs and prototypes can be tooled quickly, with a minimum of toolroom work.

Accurate Bushing Co, Garwood, NJ

MORE DATA? Circle 239, inside back cover



Drill Pointer, With Automatic Hopper Feed, Handles 1500/hr

Known as the Model 100-C WinsloMatic drill pointer, this new addition to the company's drill point grinder line will take drill sizes from No. 80 to ½-in.-dia drills. The machine, which is equipped with an automatic hopper feed, has a production rate of up to 1500 drills an hr.

The hopper feed attachment is completely automatic. Up to 500 drills can be placed in the bin which is mounted above the workhead, and additional drills may be added to hopper as required to keep production at a continuous high rate. After the grinding operation, drills are neatly deposited in a tray in front of workhead.

The Model 100-C drill pointer is completely automatic in all respects, even down to dressing and compensating of the grinding wheel. Because it has an ultra-precision point, which is concentric within 0.0002 in., drills sharpened on this pointer produce extremely close tolerance holes. It is said to eliminate most reaming operations and greatly increase tool life.

Winslow Product Engrg Corp, 47 St Joseph St, Arcadia, Calif

MORE DATA? Circle 240 inside back cover

Deburring Device Allows Deep Tapping, Fits All Tap Chucks

Burr-Bit tap hole deburring device mounts on any make tap and removes burrs at the top of the tap hole while the hole is being tapped. It is made to fit standard taps from No 2 to 1¼ in. and pipe taps, both straight and tapered, from ⅛ to 1 in.

Burr-Bit will accommodate deep tapping with the stop-collar removed and will also chamfer to various depths. An improved spring allows the device to be used with tap chucks and holders that grip the entire shank.

Vernon Devices, 481 East 3rd St, Mount Vernon, NY

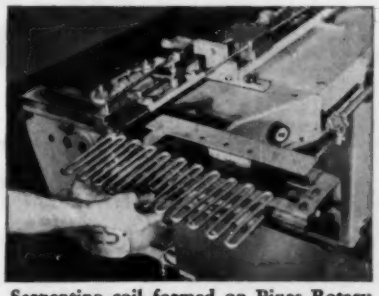
MORE DATA? Circle 241 inside back cover

IF YOU MAKE PARTS LIKE THESE...

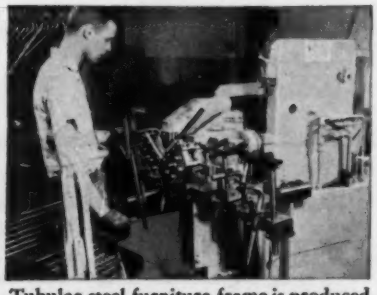
YOU CAN SAVE BY BENDING!

By production bending the "Pines-way," hundreds of metalworking plants are now benefiting from the cost-cutting advantages of cold-bending tubing, pipe, extruded or rolled shapes into parts similar to those above. Parts are produced faster, with smooth, strong bends. This means improved product quality at reduced costs.

A wide range of bending on large or small work, long- or short-run jobs, is easily accomplished by a complete line of standard Pines Bending Machines. Hydraulic power and automatic operation provide maximum accuracy, efficiency, and economy. Find out today, without obligation, how these machines can produce your parts at less cost.



Serpentine coil formed on Pines Rotary Machine at 900 bends an hour with 8% material savings, reduced assembly costs.



Tubular steel furniture frame is produced on a Pines Bending Press at the exceptional rate of over 2000 bends an hour.

WRITE TODAY FOR CATALOG AND DATA SHEETS ✱ '61

PINES ENGINEERING CO., INC.

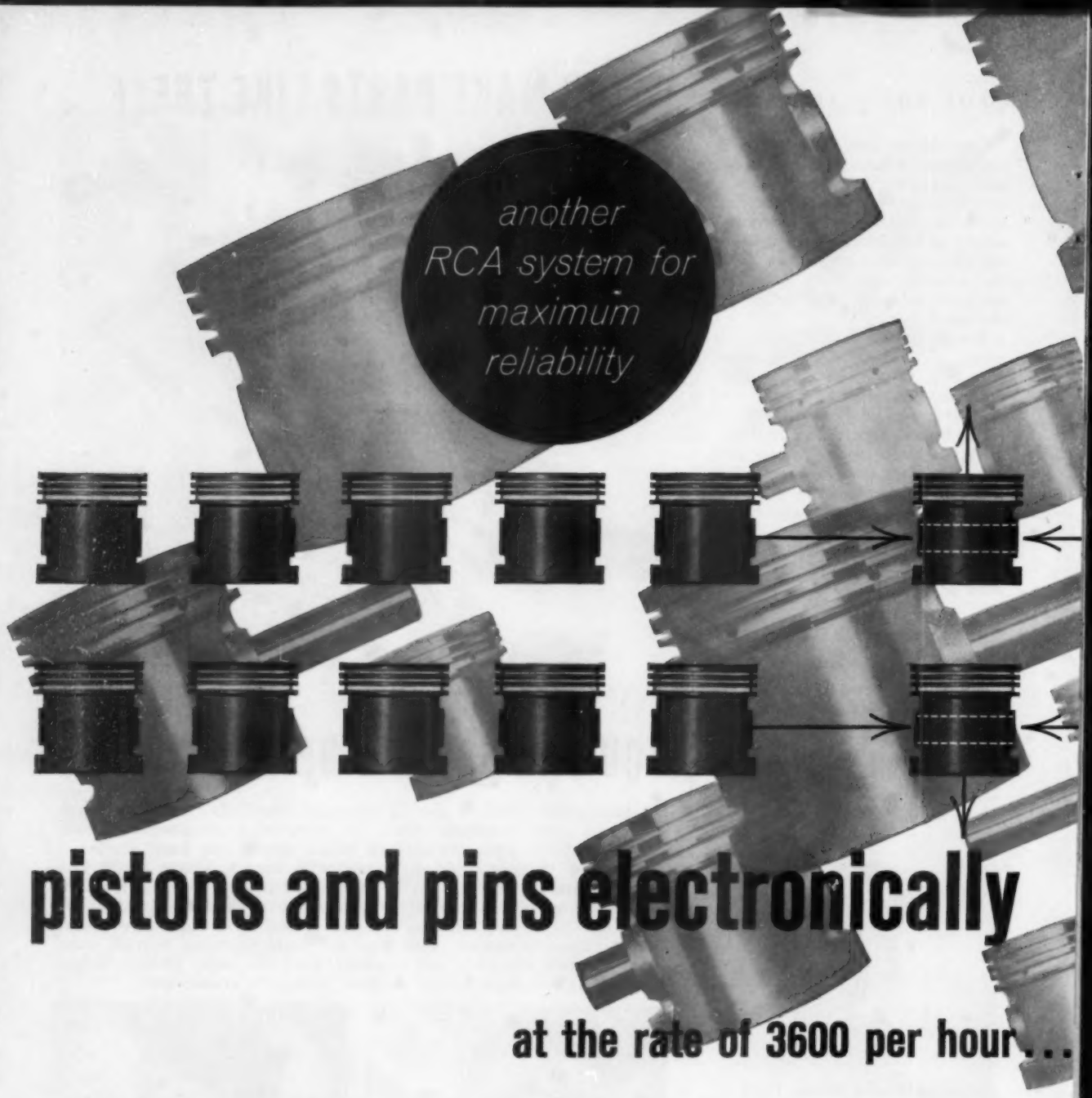
Specialists in Tube Fabricating Machinery

672 WALNUT • AURORA, ILLINOIS

PRODUCTION BENDING • DEBURRING • CHAMFER MACHINERY

▲ CIRCLE 401 READER SERVICE CARD

CIRCLE 402 READER SERVICE CARD ►



pistons and pins electronically

at the rate of 3600 per hour...

RCA HIGH-SPEED LINE INSPECTS AND MATCH-FITS PISTONS AND PINS

PISTON LINES

1. Piston pin holes are automatically bearingized and transferred to Piston inspection machine.

2. Pistons are oriented and inspected.

3. O.D. of piston skirt is gaged in two places. Overall acceptable taper +.001" and —.000". Parts are stamped and classified into 15 acceptable categories in increments of .0002" plus over and under size.

4. Perpendicularity of axis of pin bore to axis of skirt cylinder is checked. Tolerance: .001" inch per inch; failing parts rejected.

5. I.D. of pin hole is checked at 4 points. Over and under size rejected.

PIN LINES

6. Meanwhile, RCA Non-Mar Hopper feeds piston pins into Piston Pin Inspection Machine.

7. O.D. is checked at both ends. Over and under sizes are rejected.

8. OK'd pins are classified into 5 acceptable categories in increments of .0001".

9. Pins pass through 5 segregating gates and are fed to non-mar type storage bins or chutes.

ASSEMBLY

A. After each piston has been completely inspected, an electronic memory device signals for the release of the proper size pin from one of the 5 chutes. Clearance of the pin in the pin hole is held to .00015".

B. Pin is fitted into matching piston. The match-fitted parts are then moved to next operation.

inspected and matched

...with accuracies never possible under statistical control!

Mass producing high compression engines to the precise tolerances required today means speeds and accuracies never before dreamed possible. Faced with this problem recently, one leading automobile manufacturer came to RCA for a high-speed automation system for their piston assembly operation. The multi-step system designed by RCA Industrial Controls provides for precision electronic inspection, segregating and matching of pistons and pins.

In this high-speed quality control system, the output of two piston inspection lines is match-fitted to the pins coming from pin inspection line at rates up to 60 assemblies per minute! Far better engine performance from finished parts and longer operating life are the result.

With the increased emphasis on greater accuracy and trouble-free performance, many companies are supplanting statistical quality control with RCA automatic inspection systems to inspect each and every part. Whatever your requirements...a fully integrated automatic system, or a simple mechanization of a single operation, RCA offers the most versatile range of equipment available.

Why not get the complete story? Write RCA Industrial Controls, 12607 Arnold Avenue, Detroit, Michigan, or see your RCA Representative.

RCA®

The Most Trusted Name in Electronics

RADIO CORPORATION OF AMERICA

CIRCLE 403 READER SERVICE CARD

USAC THE SPACE AGE CARRIER

WHY CHOOSE A CARRIER WITH LESS SPECIALIZED KNOW-HOW?

•

TOUGH HAULING JOBS ARE ROUTINE FOR U.S.A.C.

•

HEAVY OR OVERSIZE

•

FRAGILE CARGOES

•

NATIONWIDE SERVICE

•

Write for brochures

U.S.A.C. TRANSPORT, INC.
457 West Fort St.
Detroit 26, Michigan
TWX DE899 WO 3-7913
Offices in 22 Cities

TOOL SHOW IN PRINT

Edgcomb Indicator Holder Finds Spindle Center In 1 Adjustment

A simple adjustment of the Ever-True dial indicator holder zeros in the dial indicator to a spindle centerline. Once the center is found, the setting may be locked in with a knurled knob that controls the adjustment of the dial indicator sweep. The holder will indicate from 1/16-in. to 12-in. dia and sells complete (without dial indicator) for $12.50.

Edgcomb Engineering & Engraving Co, 1105 North Hollywood Way, Burbank, Calif

MORE DATA? Circle 244, inside back cover

Lassy Gang Vise Holds Multiple Workpieces In Compensating Jaw

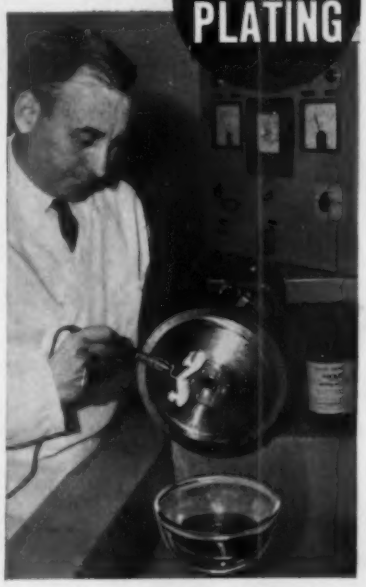
Gang vise for production milling and grinding has compensating cams that deliver direct, positive line pressure for clamping a number of work pieces of different sizes. The work-compensating jaws can be removed and ground to fit special shapes or can be replaced with other jaws fitted for special jobs.

Jaws are available for holding sixteen ½-in. pieces and call for a range of other sizes up to four, 1-in. dia pieces.

Lassy Tool Co, Plainville, Conn •

MORE DATA? Circle 245, inside back cover

MIS-MACHINED PARTS SALVAGED WITH DALIC PLATING



DALIC Nickel Plating the out-of-tolerance portion of superalloy turbine wheel to specification size.

Dalic Plating has become a recognized manufacturing method for rebuilding undersized sections of products to meet specifications. Many of America's largest companies are using Dalic Plating to restore mis-machined products to their full value.

You can build-up exact areas on components including flat surfaces, inside and outside diameters, grooves, etc. Plating thickness can be controlled accurately.

Quick Low Cost Salvage

Electroplating is done without immersion tanks, and at deposition rates 30 to 60 times faster than conventional plating. Selected areas are plated rapidly with little masking and no disassembly of components.

Deposits have excellent quality and adhesion.

Write for brochure.

SIFCO METACHEMICAL, INC.
935 East 63rd Street • Cleveland 3, Ohio
A Subsidiary of
The Steel Improvement & Forge Co.

SEE DEMONSTRATION AT
ASTME TOOL EXPOSITION
Booth 3912 — 3rd Floor
New York Coliseum, May 22-26

6 or 8 precision spindles

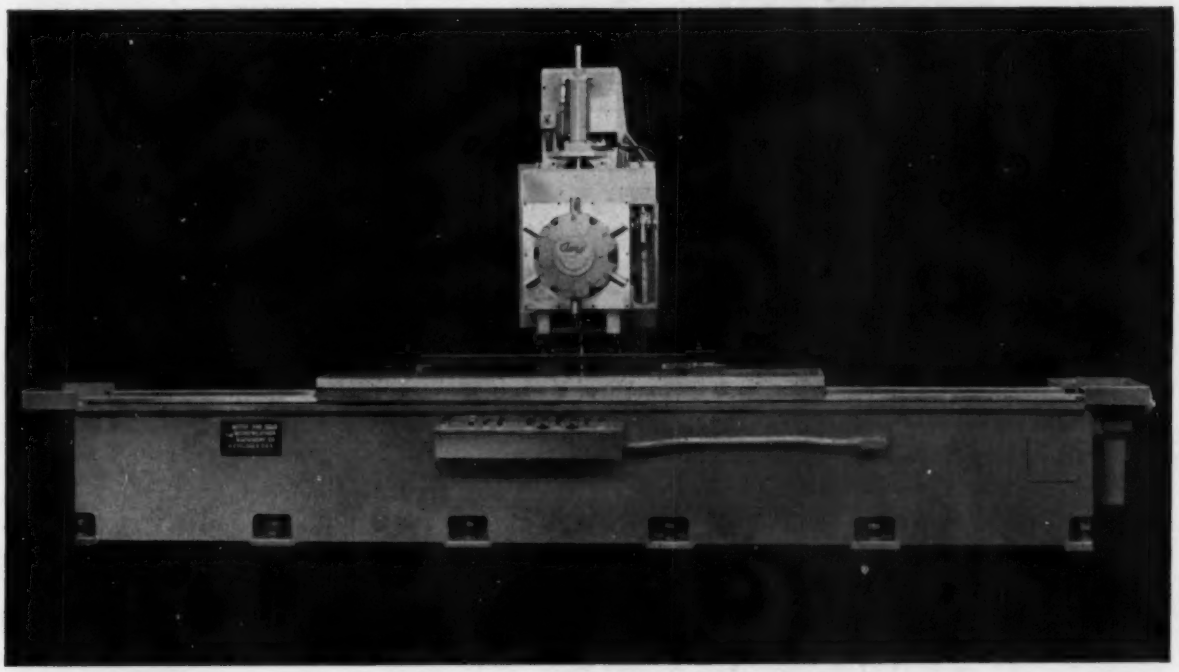
The reliability of the Avey 250 Turret-Dex matches the quality of the thousands of Avey drilling, tapping, and production machines which preceded it. It is available as either an automatic machine or numerically-controlled with rotary or two-axis positioning table. Pre-selected speeds, feeds, rapid advance, and tapping cycles. Automatic depth control for all spindles.

All spindles may be skip indexed. Automatic turret clamping. Positive spindle location. Rigid one-piece spindles, mounted in "O" precision taper roller bearings. Capacity up to 1¼" in steel.

The Avey Turret-Dex makes it more clear than ever that, for your drilling requirements, "Avey makes the right one for Avey makes them all." The Avey Division, Motch & Merryweather Machinery Co., Box 1264, Cincinnati 1, Ohio.

Write for catalog 460

Avey



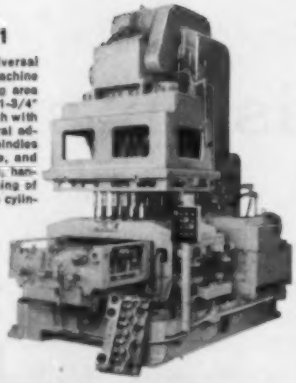
■ *Production costs drop significantly with this combination of an Avey Turret-Dex and a 12"x99" table. The operator can load many workpieces while the six spindles complete operations quickly and accurately.*

HD13

straight line drilling machine with hydraulic table feed and 18 spindles each having 11/16" diameter drill capacity in mild steel. Spindle center distances are adjustable along the 6-foot machine rail.

MODEL HU111

Hydraulic Feed, Universal Joint-Type Drilling Machine with 24" x 30" drilling area and with forty-two 1-3/4" spindle drivers, each with two-speed and neutral adjustment. Thirty-six spindles in slip spindle plate, and power shifting fixture, handle drilling and reaming of three different engine cylinder heads.



MOLINE Cost Reducing Equipment

MODEL MR148

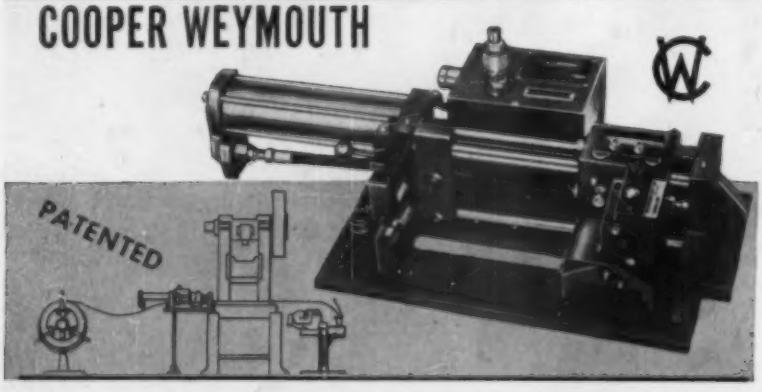
Three-way, three-spindle, horizontal boring machine with selective automatic feed cycle. Handles boring of cylinder and crank bore for 3 sizes of 1-cylinder blocks. Also bores for wet sleeves in 2- and 3-cylinder blocks.

60 years of Machine Tool Engineering Experience is at your service for 116

- Multi-Spindle Boring • Single and Multi-Spindle Honing
- Straight Line Multi-Drilling • Adjustable Spindle Drilling
- Special Multiple Operation Machine Tools *Write for Details*

MOLINE TOOL COMPANY
100 20TH STREET • MOLINE, ILLINOIS
REPRESENTATIVES IN PRINCIPAL CITIES
CIRLCE 407 READER SERVICE CARD

COOPER WEYMOUTH



air operated slide feeds

Automatic production with your present stamping and shearing equipment for increased output, efficiency and cost savings. Compact, self contained units mount to front, side or rear of press bolster; operate on 60-100 psi air lines; single screw, accurate adjustment for length of stroke. Open throat design allows wide stock feeding. Available in three styles and nine sizes with strokes to 24", for flat or irregular cross section stock up to ¾" thick and 30" wide in lighter gauges. Ideal automatic operation even on short runs.

Inquire about this and other Cooper Weymouth press room accessories; stock reels, small parts and stock straighteners, scrap choppers.

COOPER WEYMOUTH, INC.
602 Honeyspot Road, Stratford, Conn.
Visit our booth, #1239, ASTME Exposition, New York Coliseum

TOOL SHOW IN PRINT

Plastic Faces on Lixie Hammers Resist Oils, Low Temperatures

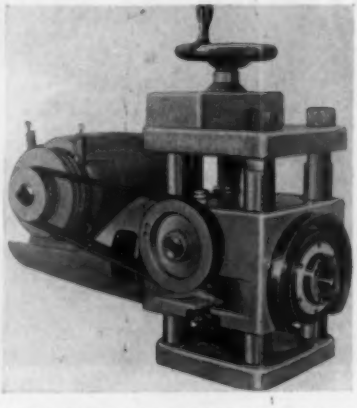
Hammer holders with screw-type plastic faces are offered in three basic sizes—from 1-in. dia to 2-in. dia—that comprise six weights. H-models are heavy-weight types with heads of malleable iron, and L-types are lightweight aluminum-head hammers.

All hammers have laminated handles with grooves for gripping when oily or greasy.

The Hilon plastic faces on the hammers retain their properties at −20 F and are not affected by lubricating and cutting oils. They are also spark-proof. Hilon Faces are available in three grades of hardness—soft, medium, and hard.

Lixie Inc, PO Box 261, Providence, RI

MORE DATA? Circle 242, inside back cover



MACHINING HEAD SPINDLE TAPERS are now precision ground after assembly to permit holding extremely close tolerances in boring and other operations. They are made in six sizes from ¾ through 20-hp capacities; there are 24 spindle speeds with optional speed ranges—*Master Mfg Co, Inc, 1300 E Ave A, Hutchinson, Kan*

MORE DATA? Circle 243, inside back cover

SANSEI

ROTARY SURFACE GRINDER

. . . Production-proven through years of extensive industry use, and constantly improved for maximum performance, we now present, for the first time in the United States, the SANSEI SS 4D Rotary Surface Grinder.

ITS UNIQUE PRODUCTION FEATURES INCLUDE:

Coordinated table rotation and ram feed for constant grinding speeds at any position.

Fully hydraulic operation of work table and grinding head to assure vibration-free, trouble-free, accurate work.

Centrifugal cooling for drastically reduced heat generation and wheel loading.

Wide variety of accessories including an automatic demagnetizer.

WE ALSO INTRODUCE A COMPLETE LINE OF PRECISION MACHINE TOOLS

including Swiss-Type Automatics, Optical Jig Borers, Tool Room Lathes, Engine Lathes, Universal, Cylindrical, Surface and Roll Grinders.

NEVER BEFORE SEEN IN AMERICA

ASTME TOOL EXPOSITION — BOOTH #3710

built by
THE SANSEI ENGINEERING WORKS, LTD.
No. 1, 2-CHOME, SHIBAURA, MINATO-KU,
TOKYO, JAPAN

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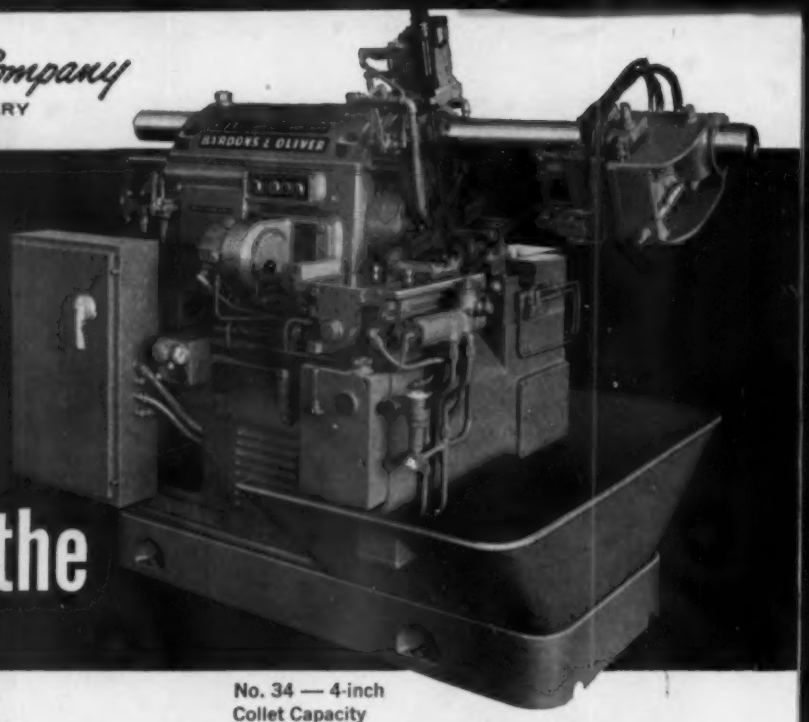
at the Frank G. Hough Company
INTERNATIONAL HARVESTER SUBSIDIARY

Bardons & Oliver cutting-off lathe



No. 34 — 4-inch Collet Capacity

slashes costs on job-shop operations

When an automatic machine enables cost reduction on both mass production and job-shop operations, it's of vital interest to management men. Such a machine is the No. 34 Bardons & Oliver Automatic Cutting-Off Lathe (shown below) busy at work for The Frank G. Hough Co. of Libertyville, Illinois, world famous builders of "PAYLOADER" tractor-shovels and "PAYMOVER" towing tractors.

Hough's methods engineer, Gerald Kannenberg wrote us:

"During the last ten months we've machined over 250 different parts on our new No. 34 B&O Cutting-Off Lathe. An analysis of five typical jobs (see chart) gives some idea of the substantial savings we're getting from this versatile machine. Our operators can economically run lot sizes as small as 50 pieces in our No. 34—and are doing it consistently.

For cut-off operations, we use higher speeds and heavier feeds with the B&O than on any other piece of equipment —and our men find the machine extremely easy to operate. Also, I want to thank you for the fine service and technical assistance we receive from Bardons & Oliver.

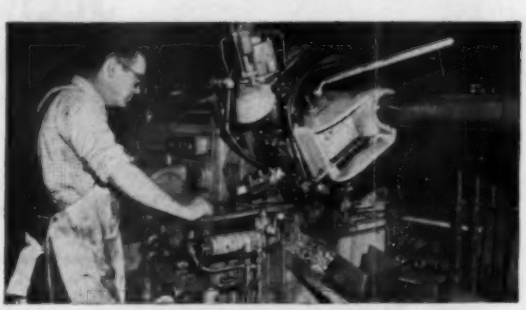
We are completely satisfied with the No. 34, and what's more important to us, the machine's production has met our highest expectations."

For the complete details on how Bardons & Oliver Cutting-Off Lathes can boost production and cut your costs, contact the Bardons & Oliver representative in your area or write directly to our main office.

Bardons & Oliver, Inc., 1133 West 9th St. · Cleveland 13, O.

Cost Comparison—Chamfer and Cut-Off Operations (B & O Lathes vs Conventional Methods)

Part Description		Cost Reduction
Bucket Link 2" diameter 17½" length AISI 1018		29%
Pivot Pin 1½" diameter 10⁷⁄₁₆" length AISI 8625		22%
Steering Cylinder Tube 3" diameter 13⅜" length AISI 1022		25%
Locating Pin ¾" diameter 2⅛" length AISI 1022		50%
Swivel Pin 1¼" diameter 5⅜" length AISI 8625		27%



Chamfering and cutting-off 3-inch OD locating lugs at the Hough plant. High-speed steel tooling is being used at 160 SFPM — 0.0075-inch feed per cut-off tool.

BARDONS & OLIVER

Manufacturers of Turret Lathes and Cutting-Off Lathes

CIRCLE 410 READER SERVICE CARD

Cast-Masters to Be Made Abroad

H-P-M Division-Koehring Co, Mount Gilead, Ohio, has granted licenses to manufacture its line of Cast-Master die casting machines in England and Australia. Cravens Ltd will produce these machines at its plant in Sheffield, England, and Johns Hydraulics Ltd in Victoria, Australia.

Both companies were granted licenses several years ago to manufacture H-P-M hydraulic presses for metalworking and process applications, and H-P-M plastics molding machines.

Norton to Make Wafering Machines

Norton Co's Machine Tool Division has purchased rights to, and will begin manufacturing, two new machines used in the wafering and lapping of semiconductor materials used in solid state electronic devices such as transistors.

The multi-blade wafering machine will cut approximately 300 wafers 0.010 in. thick from a single ingot in one operation. The four-way lapping unit produces ultra-thin wafers lapped to extremely close tolerances of thickness and parallelism. Both of the machines, in spite of their high precision, are reported to be relatively inexpensive.

Union Twist Drill Acquisition

Entire business and assets of the Reed Rolled Thread Die Co of Holden, Mass, have been purchased for cash by Union Twist Drill Co of Athol, Mass. Union will continue the operation of the business at its present location as a wholly owned subsidiary.

Thor Operating Italian Tool Firm

Thor Power Tool Co of Aurora, Ill, has begun operation of FIAP (Fabbrica Italiana Apparecchi Pneumatici), largest manufacturer of pneumatic power tools in Italy. Samuel P Gartland, former Thor sales manager in the US midwestern industrial market, is managing director of FIAP, which is located in Turin. The staff will remain intact and programs are being initiated to exchange design and technical resources of the two companies with an aim to expanding world markets for Italy-produced power tools.

Thor's investment in the Italian firm represents a substantial initial outlay of gold estimated in excess of $1 million, expects "each year to find dividends returning this gold with interest." Thor acquired a British pneumatic tool manufacturer, formerly Armstrong-Whitworth & Co Ltd, in 1950 and, within three years, trebled the subsidiary's business with US-designed tools sold on the sterling market.

FIAP began operations in Italy in 1923. To effect immediate interchange of ideas and methods, and to implement FIAP production with Thor-engineered designs, teams of technicians from both companies are now being organized to visit the respective plants.

Fir-tree turbine wheel for Boeing's T50 gas turbine engine is being produced at company's Industrial Products Division, Seattle. Hub is broached from an Inconel X forging; each blade, made of GMR-235 material, is held in place by a metal key. Wheels, which turn up to 38,000 rpm, were formerly of welded construction. Both the 7-in.-dia 66-blade gas producer and the 9-in. 50-blade power turbine wheel in the T50 turbine are fir-tree assemblies which will allow replacement of damaged blades

Chrysler Gets $56 Million Tank Order From Army

Contract has been received by Chrysler Corp for production of 660 M-60 tanks with component parts. Work will be done at the firm's Scranton Defense Plant in Eynon. The company's contract involving production of 885 tanks will be exhausted in October and the new order will assure another year of work at the Eynon plant where there are about 525 employees on the payroll.

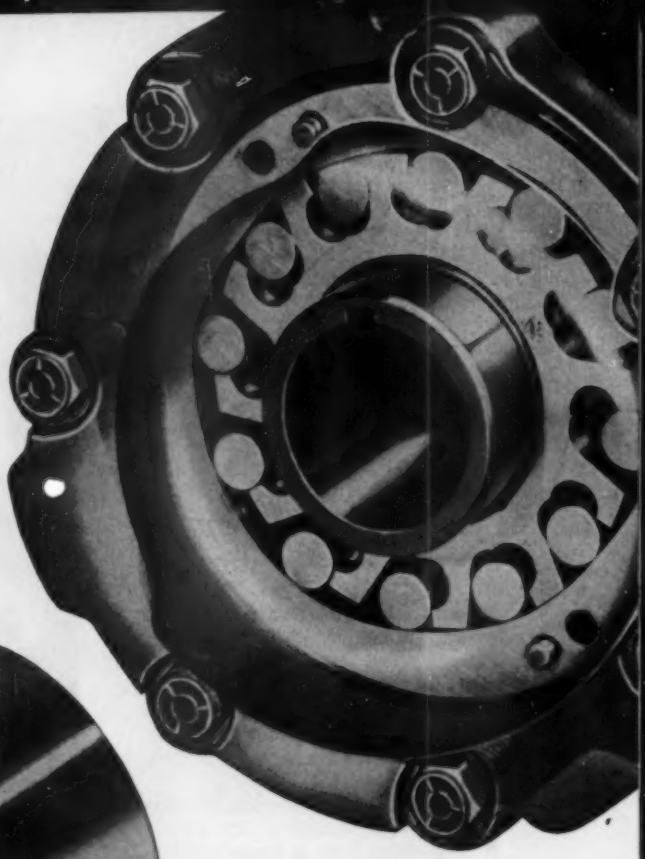
SKF to Develop Special Machines At New Maryland Facility

SKF Industries, Philadelphia, will construct a $1 million facility for manufacturing research and development of special types of bearing production machinery. Function of the new unit, to be built in Kilmarnock Industrial Park (north of Towson) is "to develop and produce special ball and roller bearing manufacturing machinery and production methods to effectively combat foreign competition through improved production operations," according to Karl Keselring, SKF vice president in charge of production.

Special equipment and techniques developed by the facility will be used in the company's production plants. The newly created manufacturing development unit will not displace

Machining greatly reduced by concentricity of

REPUBLIC ELECTRUNITE MECHANICAL TUBING



CRITICAL PART IN POWER STEERING PUMP made with Republic ELECTRUNITE Mechanical Tubing. Keyed bushing fits over engine crankshaft, provides pump drive for power assist. Close tolerance machining is essential for dual mechanical-hydraulic function.

Precise concentricity of ELECTRUNITE Mechanical Tubing solved a machining problem and cut costs for Eaton Manufacturing Company, manufacturers of power steering pumps.

At the heart of the power steering pump is a bushing made from heavy wall ELECTRUNITE which serves as the internal shaft of the unit. It fits on the crankshaft of the car and drives the power steering pump.

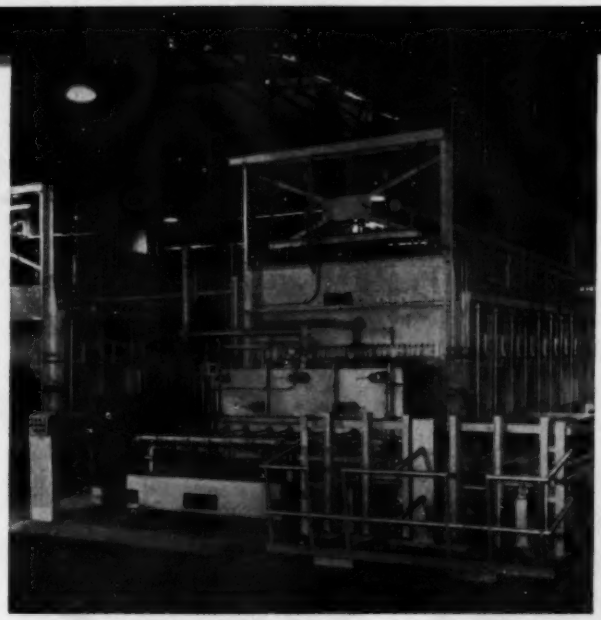
The tubing is ground on both the ID and OD. A keyway is broached on the ID the entire length of the part, approximately 2⅛ inches. Another keyway is then milled on the OD.

Since Eaton must work to very close tolerances on the part, concentricity of the OD and ID of the tubing are most important to minimize machining.

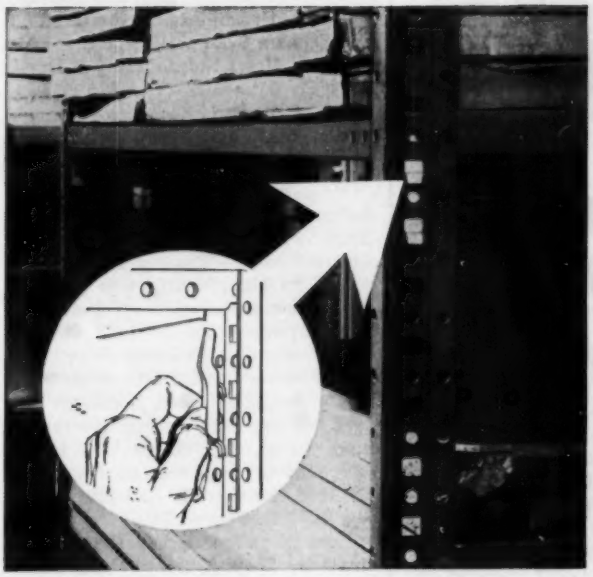
In addition, as it is part of a hydraulic system, the steel must be structurally sound without flaws of any sort.

This is another example of how precision fabricated Republic ELECTRUNITE provides high quality and cost savings for critical applications.

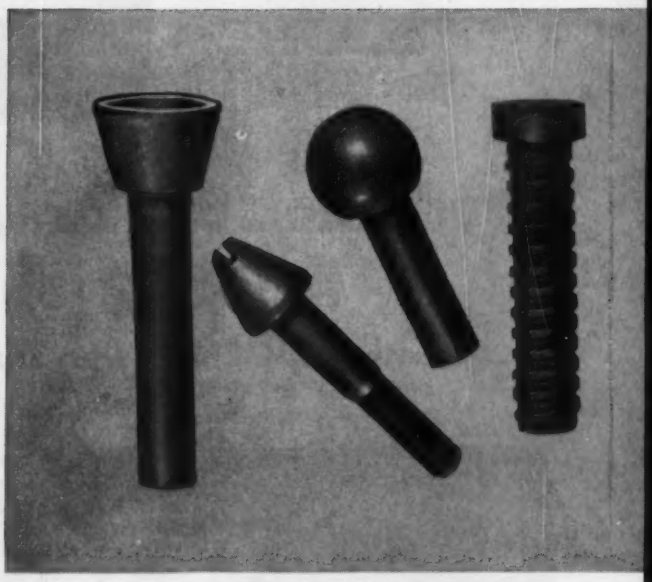
ELECTRUNITE is available in a wide range of sizes, gages, and wall thicknesses in both carbon and stainless steels to meet your needs. For full information call your Republic representative or send coupon below.



NEW ANNEALING FURNACES provide maximum heat treating capacity for cold extrusion steel. Quality of steel produced at the Chicago Bar Mill attains a high level of uniformity through heat treatment in two new atmosphere-controlled annealing furnaces. These new furnaces provide the capacity to assure prompt delivery of orders for heat treated steels.



REPUBLIC CLIP SHELVING saves valuable floor space. Complete line includes shelves, parts, accessories, and related items. Every piece is Bonderized. Erection is quick and easy, no tools needed. Adjustable arrangements meet changing shelving needs. Let your Republic representative solve your shelving problems. Write for information.



PROBLEM-SOLVING KNOW-HOW AND EXPERIENCE have made Republic a leader in custom production of Fastener and Formed Parts "Specials." Whenever standard fasteners or formed parts can't do the job, you'll save time and money by contacting Republic. The complete job—design, engineering, and production—can be handled by Republic's experienced staff and extensive facilities. Mail coupon for complete information.

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REPUBLIC HAS THE FEEL FOR MODERN STEEL

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- ☐ Republic Special Fasteners

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BEFORE BRUSHING

Corners of intricate multiple contours were hand-filed to remove burrs. Results were inconsistent. Former production rate: **24** *per hour.*

AFTER BRUSHING

All surface junctures are blended accurately to predetermined specifications. Results are uniform...quality is high. Osborn 3-A Machine production rate: **63** *per hour.*

Production up 162% on this finishing job

...with OSBORN power brushing

PUSH-BUTTON FINISHING OPERATION . . . *with Osborn 3-A Machine using Osborn Economy Wire Brushes. Operator simply loads part...starts pre-set brushing cycle... and unloads part after brushing.*

Formerly, this air conditioner manufacturer finished 24 compressor bodies per hour. He now finishes 63 per hour...*a 162% increase in production.* But that's just the start.

Quality now is uniform because Osborn power brushing thoroughly removes all burrs that might ultimately damage the compressor. Each surface juncture of the intricate contour is also formed to an exacting, predetermined blend . . . all automatically.

Your Osborn Brushing Analyst will gladly provide complete details. He will show how you can benefit on similar operations in your own plant.

Write now for full details on Osborn Metal Finishing Machines. *The Osborn Manufacturing Company, Department C-111, Cleveland 14, Ohio.*

*'61

Booth 2407

OSBORN

Metal Finishing Machines...and Methods • Industrial Brushes • Foundry Production Machinery

any current employees, and it's eventually expected to employ about 100 development engineers and technicians.

Ford Sells Plant to Reynolds

Ford Motor Co has sold its Chester, Pa, automotive assembly plant to Reynolds Metals Co for $2.2 million. Assembly operations at the plant had been discontinued March 15. Reynolds will use the installation, which has about 650,000 sq ft of floor space, as a fabricating facility.

Submarine Contracts

Contracts totaling $151,514,000 for construction of two nuclear submarines have been awarded by the Navy. The Electric Boat Division of General Dynamics Corp, Groton, Conn, has a $76.2 million order and Newport News Shipbuilding & Drydock Co will work on a $75,314,000 contract. Awards do not cover propulsion machinery, weapons systems, and certain other equipment.

Automation Industry Expanding

Some 744 firms are listed in the new 1961 edition of Thomas Register of American Manufacturers as producers of automation systems and component parts. Prior to 1955 the industry wasn't sufficiently developed to warrant a classification of its own in the Register; when it did, in the 1955 edition, only six manufacturers were listed, the others still being identified as component part makers. By 1958 the number had jumped to 619, and this year to 744.

New York State has the largest number of companies making automation equipment, 147; New Jersey is second with 70, Illinois third with 68, and Michigan fourth with 67.

Navy Contract to GE

Navy has awarded a $26.6 million contract to General Electric Co, Schenectady, NY, for procurement of nuclear components of Polaris submarines.

Di-Acro Buys Electronics Firm

Seco Electronics Inc, Minneapolis, has been purchased by Di-Acro Corp, Lake City, Minn. Seco, which makes specialized electronic test equipment, will continue to operate with its present management under its own name as a wholly owned subsidiary. Purchase is outright diversification for Di-Acro (formerly O'Neil-Irwin Manufacturing Co) which makes a complete line of precision metal-

working machines that bend, roll, notch, punch, and shear metal sheets and bars.

$2.7 Million Metallurgy Building Nearing Completion at Case

The Charles M White Metallurgy Building, named for the former board chairman and chief executive officer of Republic Steel Corp, and a longtime booster of the Institute's Department of Metallurgy, is nearing completion on the campus of Case Institute of Technology in Cleveland. Scheduled for September occupancy, it'll house integrated facilities for the basic study of metal and other materials and will include research areas for study of fundamental characteristics of ultra-high temperatures and properties of ultra-high strength materials, plus laboratories for investigation of principles of processing the new materials. Special facilities will allow the study of metals under a complete range of environments, including temperatures, pressures, loading conditions, and exposure to other elements.

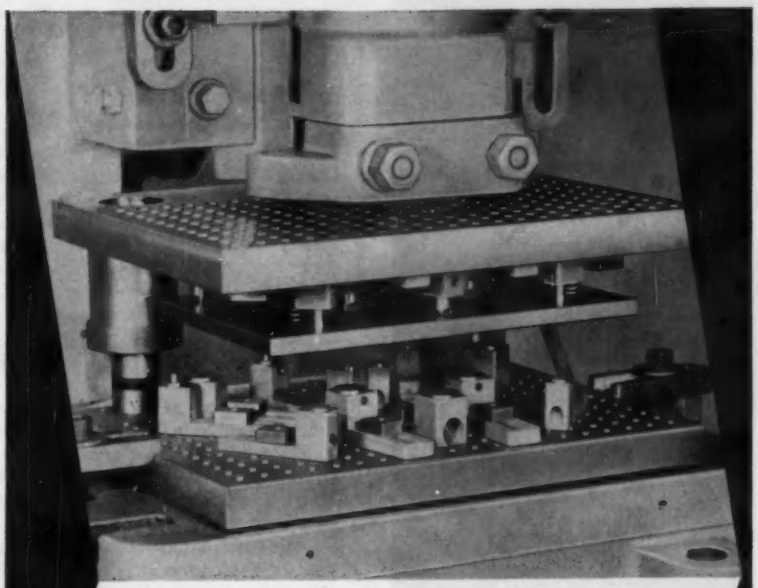
Kaiser Installs New Facilities To Refine Super Purity Aluminum

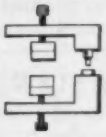
Installation of new facilities at Kaiser Aluminum & Chemical Corp's Mead, Wash, reduction plant increases by 55% the company's capacity to produce 99.99 plus pure aluminum. Five specially designed refining cells, largest of their type in the industry, currently are in full operation. Each cell has a rated capacity in excess of 380,000 lb per year, making Kaiser's production capacity for the metal more than 5.3 million lb annually.

New installations mark the latest expansion of super purity production at Mead. Last fall a series of refining cells were installed which tripled the plant's capacity.

AM/MM

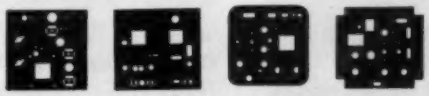
"The evaluation committee not only turned down his suggestion but they also turned down any others he might make in the future."





Punch Multiple Holes in One Operation with REUSABLE DI-ACRO ADJUSTABLE PUNCHES AND DIES

Di-Acro Adjustable Punches and Dies offer you an inexpensive means of rapid tooling for multiple punching of holes of a variety of shapes and sizes. They will do the job in a fraction of the time it would take using a single station punch press and at a fraction of the cost of standard tooling. All tooling can be arranged in a countless number of patterns so that most multiple hole punching jobs can be accomplished in one operation. Tooling can be reused again and again. Holes can be as close together as ¾" on centers. A template locates your punches and dies accurately. All Di-Acro punches and dies are concentric, readily interchangeable. Standard rounds, squares, rectangles, ovals, D's and other shapes in a variety of sizes are available from stock.



Di-Acro Adjustable Punch and Die catalog is complete with detailed instructions and prices on all die sets, punches and dies. Consult the yellow pages of your phone book for the name of your nearest Di-Acro Distributor or write us for your free copy.

di-acro PRECISION METALWORKING EQUIPMENT

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FIELD REPORT

American Saw & Tool Co Forms New Corporation

Formation of Vermont American Corp has been announced by American Saw & Tool Co of Louisville, Ky. The corporation, with headquarters in Louisville, will serve as parent company to American Saw and its divisions: Vermont Tap & Die Co, Multi Metals Inc, Deluxe Saw & Tool Co, Vermont-Pacific, and Threadit.

Vermont American factories for the production of steel and carbide tipped circular saws, taps and dies, tungsten carbide and other cutting tools, are located in Vermont, North Carolina, California, and Kentucky. Establishment of the new company was made in the interest of more coordinated management control and greater merchandising efficiency. No changes in product lines or manufacturing facilities are planned.

Ryan Gets $1.8 Million Order

Preparation of 110 Ryan Q-2C Firebees for the ninth World Wide Weapons Meet of the USAF will be carried out by Ryan Aeronautical Co's Aerospace Division, San Diego, in a program expected to exceed $1.8 million. The Q-2Cs, America's most widely used free-flying jet target missiles, will be a principal target in the Weapons Meet, designated "William Tell 1961" at Tyndall Air Force Base, Fla, Oct 16-26.

Tool Research Sets Up R&D Center

A Research and Development Center has been established by Tool Research & Engineering Corp, Beverly Hills, Calif. Studies will be conducted in pure and applied research and development projects in exotic metals and other materials and processes for advanced aircraft, missile, and space vehicles. The Center, which will direct the R&D activities for all divisions of the company, will also be available for external defense, industrial and commercial studies and projects.

Bancroft-Hickey Expansion

Bancroft-Hickey Manufacturing Co, Bristol, Pa, has acquired all of the outstanding capital stock of Victor Inc, Paoli, Pa, maker of diamond blades and masonry saws marketed under the tradenames of Victor, Valor, Valsafe, and Di-Namic.

Bancroft, recently acquired subsidiary of American Chain and Cable Co, manufactures grinding wheels and other abrasive products.

Fairchild Adding Space

Construction of a 40,000 sq-ft addition to its transistor manufacturing and headquarters facility at Mountain View, Calif, has been started by Fairchild Semicondutor Corp. Scheduled for completion in the fall, the new structure which will cost more than half a million dollars, will bring total manufacturing and office space to 108,000 sq ft.

In addition to manufacturing high-performance silicon transistors and diodes, the company has recently introduced a line of electronic building blocks called Micrologic elements for computers. It's also entered the industrial transistor market and the transistor test equipment market, and has a current work force of 1550.

New B-58 Orders to Bendix

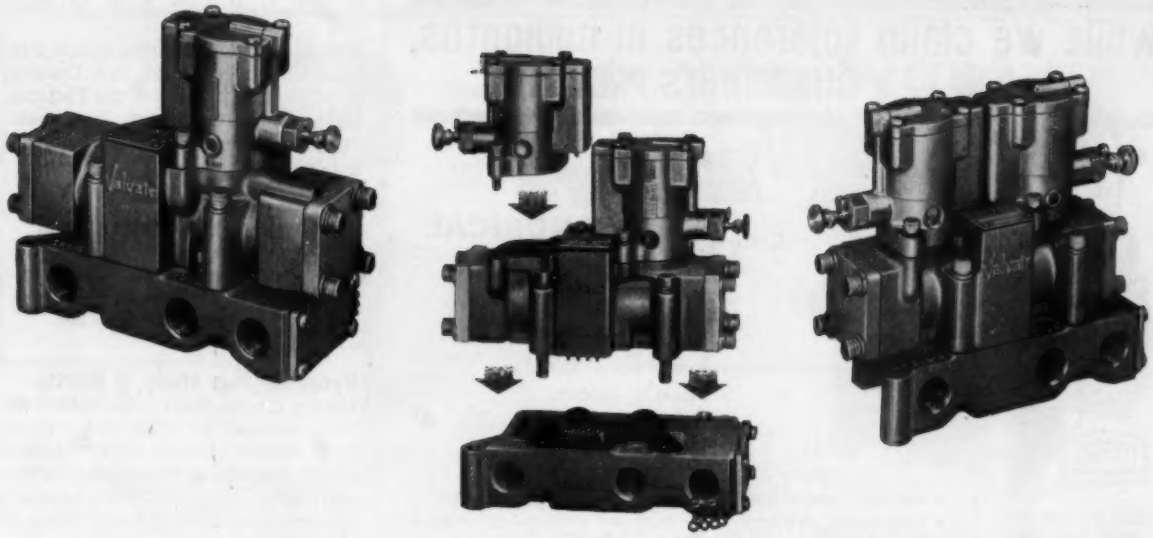
Flight control systems and air data computers for the Convair-built B-58 Hustler will continue in production at the Eclipse-Pioneer Division of Bendix Corp in Teterboro, NJ, under new contracts totaling $27 million. Orders include $23 million to build the complex control systems for an additional 50 Hustlers, expanding SAC's fleet of these supersonic bombers to 116 aircraft. Additional $4.3 million is for production conversions of previously built Hustlers to present tactical configuration and modification of four of the AF delta wing jets as trainer bombers.

Ford Sets Up New Division

Ford Motor Co has established a Motorcraft Division which will include the company's Motorcraft marketing operations which distributes parts, and the replacement parts marketing organization acquired last month from Electric Autolite Co.

AM/MM

"So that's what flammable means."



4-way single or double pilot-operated types, for sub-base or manifold mounting. Aluminum and stainless steel components assure multi-million cycle dependability. Interchangeable pilots, with coils guaranteed against burn-out for life of valve, fit any plug-in Speed King. Coils for AC or DC, most voltages . . . 35—200 psi range . . . integral junction box . . . optional manual over-ride, sub-base connected external pilot supply . . . ¾ in. separate exhaust ports, ½ or ¾ in. inlet and cylinder ports.

VALVAIR® 1/2 in. NPT PLUG-IN VALVES

Based on the service-proved design principle of Speed King ¼ in. plug-ins, Valvair's ½-¾ in. plug-in valve series provides plug-in convenience and versatility to a wider range of control valve applications.

Electrical and pneumatic circuits are completed automatically when valve and pilot are plugged in . . . bolted down. The result—cost-cutting reduction of original installation and maintenance time. All power connections are made permanently in sub-base or manifold . . . there's no need to disturb piping or wiring for quick in-service maintenance.

What's more, advanced design shortens stroke . . . speeds response. Separate coded (4-wire) circuits on double solenoid models meet JIC requirements. Flow area through valve and sub-base equals or exceeds that of full ½ in. pipe.

Whether your control valve applications are on the drawing board or now in service, it'll pay you to investigate the advantages of Valvair plug-in design. A call to your nearby Bellows-Valvair field office will bring prompt application engineering recommendations.

For more information, write for Bulletins SPL and DPL. Address Bellows-Valvair, Akron 9, Ohio, Dept. AM-561.

Bellows-Valvair

AKRON 9, OHIO

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

B170

while we claim tolerances in millionths, customers PROVE IT!

Myford 5" x 12" CYLINDRICAL GRINDERS

Engineered to grind:

- Round to .00002".
- Parallel within .00001".
- Repeat to .00001".
- Finish to 3 micro-inches.

Check these exclusive features . . .

- Cartridge type nitralloy wheel spindle — rapidly interchangeable.
- Long tapered, phosphor bronze front, and preloaded twin angular contact precision rear, bearings — forced lubrication.
- Wheel feed with hardened threadground feedscrew.
- Fine infeed to dead stop, sensitive to and graduated in 25 millionths.
- Live and dead workhead spindle — D.C. speed selection (75 to 780).
- Internal grinding attachment (17,500 to 22,000 RPM).
- Full range of accessories including collet attachment, swivelling workhead, angular and radius dressers, etc.

Still the best and most reasonably priced . . . at **$2,850** COMPLETE

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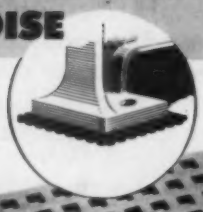
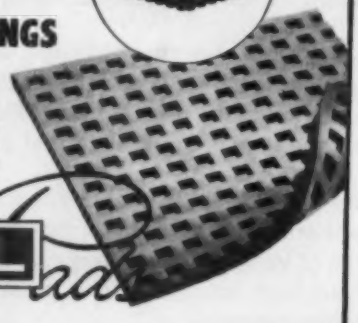


NEW Revolutionary Design

LOW COST MACHINE MOUNTINGS

Eliminate Anchor Bolts Cement and Lag Screws

Installation so easy! Just cut to shape and size you desire from standard 18" x 18" FABCEL sheets. Slip into position, then check the difference in time and money!



FABCEL Pads

Patent Applied For

FABCEL'S engineered, recessed suction cells lock machine to floor. FABCEL Neoprene Pads cut job rejects, increase life of machines and buildings.

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Representatives in Principal Cities

In Canada: International Equipment Co., Ltd., Montreal, P.Q.

-made by the makers of Fabreeka-

FIELD REPORT

Two parts manufacturing plants purchased from Autolite, the Owosso, Mich, battery plant, and the Fostoria, Ohio, spark plug plant, have been assigned to the Hardware and Accessories Division.

Brooklyn Firm Moves to Miami

Perkins Marine Lamp & Hardware Corp has moved its operations to a new 80,000 sq-ft plant in Miami, expects to employ more than 200.

Hydrofoil Ship Study to Martin

Martin Co, Baltimore, has received a Navy contract for study of the structural aspects of large hydrofoil ships which, because of reduction in water resistance, can achieve ultimate speeds three to five times those of conventional craft.

Martin has been conducting independent studies for the past two years, using its existing marine facilities beside the Middle River plant, and a corps of engneering staff members and consultants some of whom began studying hydrofoil possibilities as far back as 1942 with a view toward their use in seaplanes the company was then manufacturing.

Clickety-Clickless Tracks Planned for Railroads

A process that is estimated will save railroads $980 a mile annually in track maintenance costs may cause some oldtime passengers to regret the passing of the familiar, rhythmic clickety-click that's always been a part of train travel.

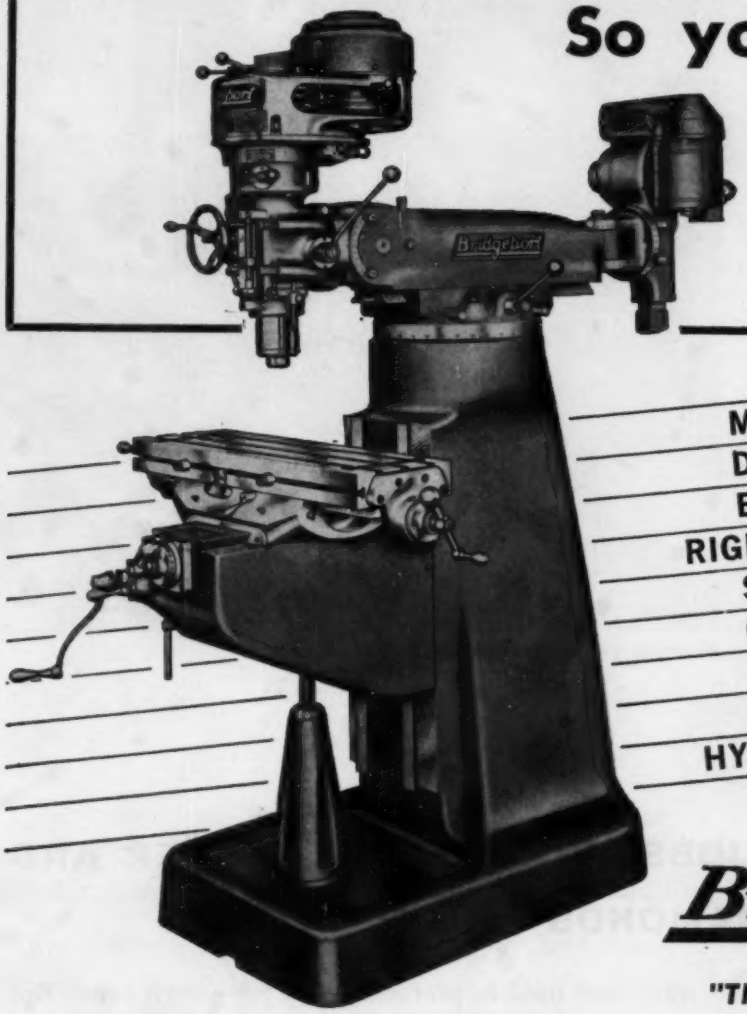
Wiesner-Rapp Co, Buffalo machine tool builder, is manufacturing equipment for a new mobile rail-welding process that will be ready to be used this summer in making continuous

AM/MM

"Hey, Boss! Want to see something funny?"

So you want VERSATILITY?

Here it is . . .



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"THE MOST FOR THE LEAST"

ATTACHMENTS AND ACCESSORIES to increase versatility

Milling, Drilling and Boring Attachments: Model "J" 1 HP; Model "M" ½ HP; Model "R" ½ HP and Model "C" ¼ HP (Rigid Spindle)

- Cherrying Attachment
- Slotting Attachment
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- Hydraulic Duplicators (1, 2 and 3 Dimension)
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- Lights
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- Quill Master Attachments
- Quill Master Right Angle Attachment
- Shell Mill Holders Nos. 1, 2, 3
- Fly Cutters, FC-3, FC-4
- Threaded Arbors
- Stub Arbors
- End Mill Holders
- Spindle Adapters
- Vises Nos. 1 and 2 (Swivel and Plain)
- Profilers for Model "J" and "M" Heads
- Boring Heads Nos. 1 and 2
- Collets
- Chucks (Jacobs and Albrecht)
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Manufacturers of High Speed Milling Attachments and Turret Milling Machines

Diamonds machine ceramic parts

Diamonds polish dies for plastic dinnerware

EACH OF THESE JOBS IS NOW DONE BETTER AND CHEAPER WITH DIAMONDS

Other abrasives and cutting tools were once used to perform every job shown here. But it was found, in every case, that diamonds do the work better, last longer, are more economical than the old way.

These pictures prove the versatility of diamonds, too. Look at the different *kinds*

Diamonds remove bumps from concrete runways and highways

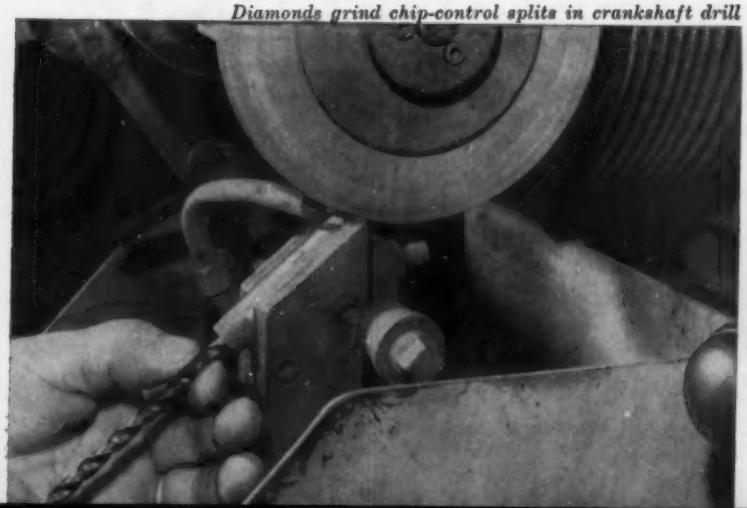
Diamonds edge automotive safety glass

of jobs they can do—everything from polishing the sensitively controlled dies that shape plastic dinnerware to shaving the bumps from a concrete jet runway.

If you cut, sharpen or smooth in your business, you can probably use diamonds to advantage. Next time you buy wheels or tools, ask for diamonds. Test them against the method you're now using. You'll find out how economical a diamond can be.

INDUSTRIAL DISTRIBUTORS (SALES), LTD.; LONDON

Diamonds grind chip-control splits in crankshaft drill



INDUSTRIAL DIAMONDS
CUT PRACTICALLY EVERYTHING . . .
ESPECIALLY YOUR PRODUCTION COSTS

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Model 88 Through-Feed Centerless Microstoning Machine for automatic production and Microstoning head of the Model 9681 Microstoner, for attachment to lathes and other machine tools.

Microstoning Produces Controlled Microinch Surfaces Fast, Precisely, Profitably

Remarkable but true . . . operations are eliminated with Microstoning. You get results at least equal to — but usually much better than — you get with costly, time-consuming precision machining, grinding and handwork. And you get these results in the shortest possible time: One company cut finishing time from 30 hours to 4 hours, another from 30 seconds to 5 seconds!

Microstoning is the exclusive Taft-Peirce/Supfina process in which special Microstones in a wide range of grits and bonds oscillate pneumatically against work pieces. They take the shape of the work, reduce geometric error — in cylinders, out-of-roundness — to a minimum. Microstoning brings work from relative roundness to any desired finish — even fractional microinch if specified — in one quick cycle.

Ask your Taft-Peirce agent to demonstrate how you can *improve quality* while *reducing costs* with Taft-Peirce/Supfina. Or write for detailed information.

Finish it with

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TAFT-PEIRCE *SUPFINA*

TAFT-PEIRCE MANUFACTURING CO. 13 MECHANIC AVENUE, WOONSOCKET, R. I.

strips of track in quarter-mile jointless, click-less lengths. Ordinarily there are about 37 separate sections, bolted together, in a quarter mile of rail. The new process (developed by Mobilweld, a subsidiary of Poor & Co in Chicago) involves the use of an electric welder to join together stretches of track into quarter-mile lengths and a milling machine to smooth off the excess weld. Both the welder and milling machine are being supplied by Wiesner-Rapp for mounting on a truck trailer that can be equipped with railroad car wheels and parked on a siding at the site where the track welding is to be done. The trailer can be telescoped to a length of 40 ft when it's moving over the highway and then extended to 62 ft when it's parked on a siding.

Company hopes eventually to get into the manufacture of the entire installation for Mobilweld—not only the welder and miller, but also the truck-trailer and power generating equipment. Cost of the machines for the first unit will be about $100,000; the complete mobile welding unit which W-R hopes later to build will approximate $500,000. The first unit is scheduled to start welding track in July. The B & O may be the first to use it, although Mobilweld is negotiating with other roads also.

Superior Coach Gets Contracts

Two new government orders which will add $1.5 million of new production and 300,000 additional working hours at its Kosciusko, Miss, plant have been received by Superior Coach Corp, Lima, Ohio. In addition, the company's International Division, which operates out of the Kosciusko plant, will extend its operations to serve plants in Indonesia, Afghanistan, and the Philippines as well as the four plants presently served in South America. The Mississippi facility employs 375 in the manufacture of school buses, transit coaches, and funeral cars.

Reflectone Electronics Inc . . .

. . . Stamford, Conn, has set up a manufacturing and research facility at Fort Lauderdale, Fla. The new plant will employ 250. Company designs and manufactures simulation and training systems used in preparing personnel for military and industrial equipment operation. It also makes electronic systems and subassemblies and has developed an automatic bank depositing machine which it expects to sell to banks for use in shopping centers and out-of-

the-way locations. The machine accepts coins, currency, and checks along with deposit slips, giving in return a validated deposit slip.

B&D Designs Cordless Drill

Black & Decker Manufacturing Co, Towson, Md, has come up with what is reported to be the world's first cordless electric drill. The portable unit has a self-contained energy source that combines a series of power cells with a radically different motor, eliminating the need for the conventional cord and plug-in outlet. Totally enclosed motor is described as quiet and shock-proof.

Pierce Sells Subsidiary

Pierce Industries of Indiana Inc (Anderson), diversified industrial firm, has sold its subsidiary, Pierce Industries of Missouri Inc which operates Rupert Diecasting Co of Kansas City, Mo, and Gibbs Automatic Moulding Division, Henderson, Ky. Purchaser is Jefferson W Mitchell Jr, formerly a Pierce vice president. Terms of the agreement call for return to Pierce Industries of 14,000 shares of the company's common stock formerly held by the purchaser of its subsidiary, plus $244,000 in first mortgages on equipment and other property located at Pierce of Missouri's two operating units. These two plants now produce zinc and aluminum die castings and injection molded plastics. Pierce owns a wide variety of other manufacturing subsidiaries and divisions, chiefly in the metal products field. Among these is Pierce Governor of Anderson, Ind, leading producer of mechanical governors. •

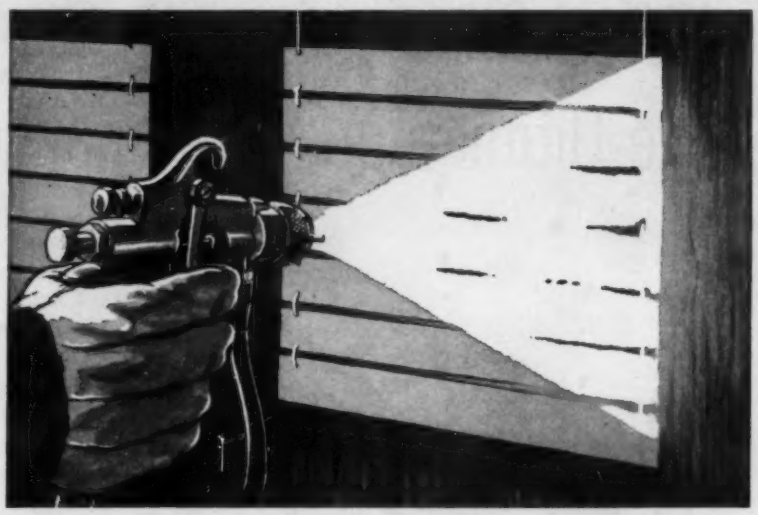
AM/MM

"Ya s'pose things are that tough?"

To avoid spray booth troubles

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 SERVICE MEN • OVER 160 MATERIALS



Oakite curtain water treatment takes the "tack" out of overspray

Just a few inexpensive ounces of the right Oakite additive in the spray booth water curtain save hours of clean-up time. The reason: Oakite chemicals surround each droplet of paint with an "anti-stick" film that keeps spray from adhering to walls, pumps, lines and water nozzles. Paint that doesn't settle or float immediately will still wash through the system—but it won't stick, won't clog the sprays. The result: a water curtain without gaps, a smooth running system, *no* unplanned downtime.

There's a full line of Oakite water additives . . . one to match any of the countless paints, enamels and organic coatings. The *right* one will help paint sink to the sump . . . or float to the surface for skimming off . . . or overcome special hard water troubles . . . or combat foaming problems. What's *your* problem? Ask the Oakite man to make free tests in your paint spray booth. They won't interfere with production. They may save you hours of spray booth downtime. Bulletin F-9443 tells more. Write Oakite Products, Inc., 28A Rector St., New York 6, N. Y.

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OAKITE

over 50 Est. 1909 SCIENCE

years' leadership in industrial cleaning

To Achieve the Optimum in Tool Design... the Ultimate in Performance...

Typical of the continuing forward progress in manufacturing techniques which has characterized its service to the metalworking industry, National Tool offers a facility to provide the ultimate in accuracy and speed.

Introduction of the Bendix G-15 Digital Computer into its tool engineering system obtains by electronic computation a complete analysis of part and tool elements . . . attaining the highest levels of speed and accuracy. Accomplishing what formerly required hours or even weeks of manual calculation, completely validated results are possible in a matter of minutes.

Optimum tool design, development of absolute specifications to micro-measurements for mating parts, accuracy and tolerance factors hitherto impossible . . . these are among the many production benefits that lead to longer, more efficient tool life.

NATIONAL Tools CLEVELAND

NATIONAL TOOL COMPANY
A Division of
National Cleveland Corporation
11200 Madison Avenue Cleveland, Ohio

For more than a half century National Tool has supplied high quality precision cutting tools to the metalworking industry.

For your special cutting tool requirements call your National Tool representative.

Versatile, flexible, and with unlimited application range, data can be fed into the Computer for single or repeat solutions . . . memory stored and automatically available.

CIRCLE 424 READER SERVICE CARD

NAMES IN THE NEWS

Hanson-Van Winkle-Munning Co, Matawan, NJ has elected **Warren S Wilkinson** (top) president to succeed **Louis M Hague** who has been named board chairman and chief executive officer. Mr Wilkinson was previously executive vice president

William E Rutz, executive vice president and director of **Giddings & Lewis Machine Tool Co,** Fond du Lac, Wis, is a member of the seventh Department of Commerce Trade Mission to Germany which is touring that country from April 22 to June 14 as part of the US government's program to promote US foreign trade. One of five businessmen chosen by the government, Mr Rutz has had over 40 years' experience in tool and die making, die and machine design, precision heavy duty machine tools, and cutting tools. He has traveled extensively in Europe, the Near East, Asia, Australia, and New Zealand in machine tool trade development.

Nicholson File Co, Providence, RI, has elected **Edmond A Neal** vice president in charge of domestic sales. He was formerly vice president and sales manager.

Studebaker-Packard Corp has named **Frank J Suslavich** vice president and general sales manager of the Auto-

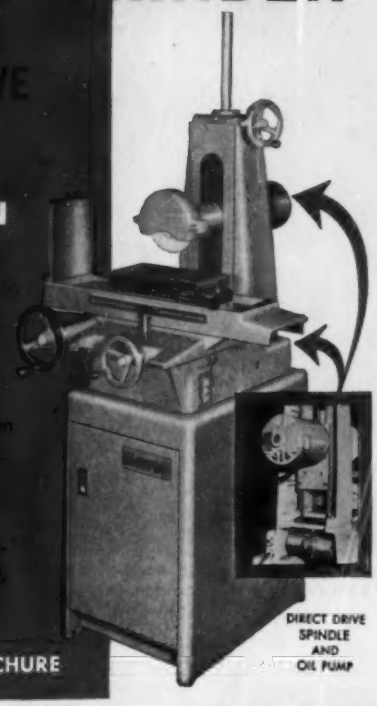
(Continued on p 276)

Harig 612
SURFACE GRINDER
with
NEW . . . EXCLUSIVE
AUTOMATIC FORCED LUBRICATION

- Continuous flow, recirculating system
- Washes away damaging grinding dust
- Triples life of ways
- Preserves original accuracy
- Promotes easy table operation
- Reduces maintenance—*all complete machine*

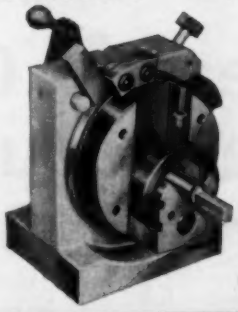
. . . and many other features included as standard equipment, all at a surprisingly low price!

WRITE FOR HARIG 612 BROCHURE



THE FASTEST WAY TO GRIND PERFORATORS . . . INCREASE ACCURACY

HARIG GRIND-ALL FIXTURE



Easily grinds irregular shaped perforators concentric with shank within ± .0001 accuracy. Also can be used for milling, boring, and inspection. New features include V-block adjusting screw and sine arrangement to obtain any desired angle. Attachment available to convert Grind-all into precision Radius Dresser.

WRITE FOR NEW GRIND-ALL BROCHURE

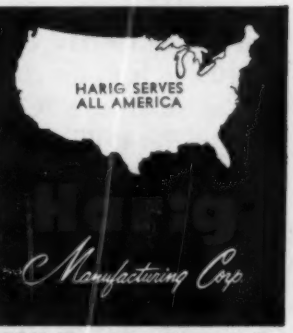
OTHER PRODUCTS BY HARIG MACHINE TOOL DIVISION

VISES

RELIEF-GRINDING FIXTURE

AIR-FLO FIXTURE

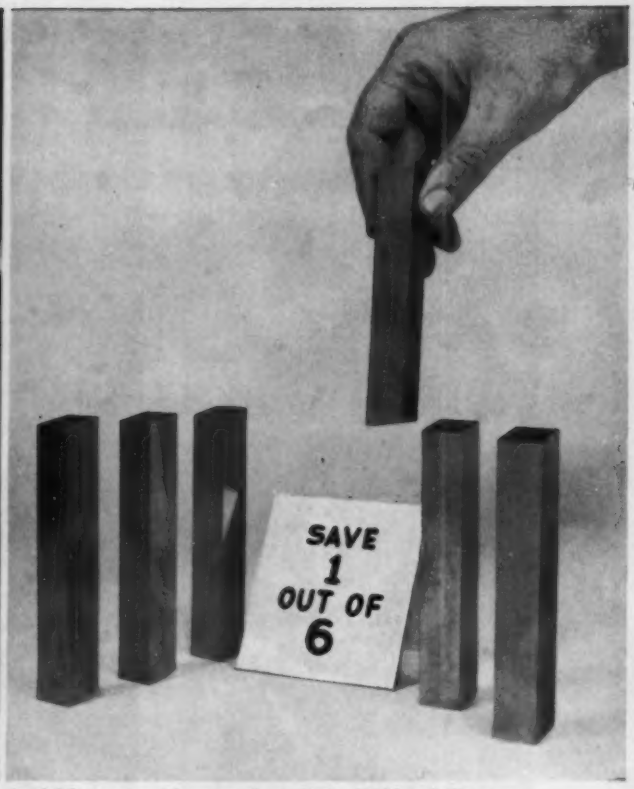
WRITE FOR BROCHURES



Visit Harig Booth 1514 ASTME Show

5743 W. Howard St. • Chicago 48, Ill.

No discarded cutting oil because of dilution. Cleartex is used for both cutting *and* lubrication. Works as a hydraulic fluid, too.



Tool life increased as much as 20%. Undiluted Cleartex gives maximum time between regrinds . . . more parts per tool.

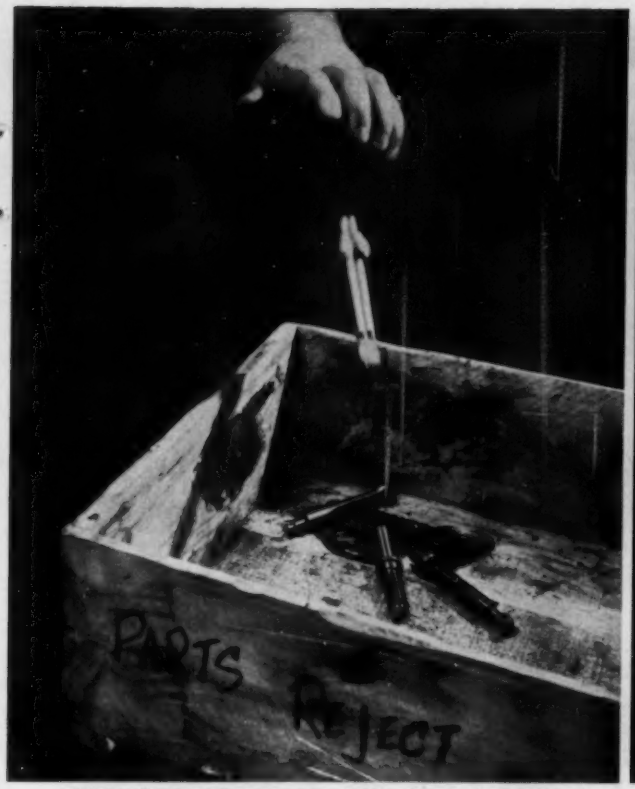
END CUTTING OIL

Texaco's "Cleartex Cure" helps cut per-piece production costs by as much as 40 per cent

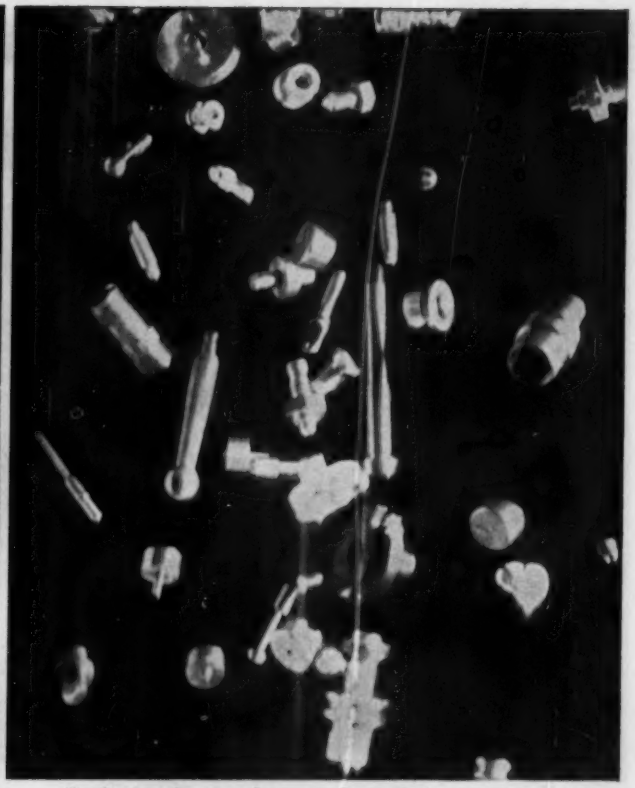
How the "Cleartex Cure" works—By using Cleartex in both the cutting and lube sumps of your automatics, a "Cleartex Cure" eliminates all losses due to diluted cutting oil. *Cleartex is a triple-purpose oil . . . works equally well for cutting, lubricating and as a hydraulic fluid.*

A Texaco metalworking engineer comes to your plant . . . surveys your automatic set-up . . . tells you which machines can benefit from Cleartex. Since lube oil—and sometimes hydraulic oil—leaks into the cutting oil sumps of most automatics, chances are that the "Cleartex Cure" can substantially cut your per-piece production costs.

Send for free booklet—Our illustrated booklet, "Cleartex in Automatic Screw Machines," gives you full details on how diluted cutting oil may be eating into your profits. To get your copy and an authoritative survey of your automatics, call



Rejects decreased as much as 22%. Cleartex keeps tools sharp and properly lubricated. Finished work is dimensionally accurate.



Production increased as much as 33%. Cleartex minimizes downtime required for tool changes, repair work and adjustments.

DILUTION FOREVER*

the nearest Texaco distributing plant, or check and mail the coupon.

More savings possible – A complete Texaco "Stop Loss" Program may mean even greater savings for your operation. Under the Program, Texaco engineers help select the right lubricant and lubrication interval for every piece of equipment in your plant. They'll also help you set up a workable system of lubrication control.

These two films can improve your profit picture— Texaco has a special color film on the selection and use of cutting oils...and another that dramatizes for management the cost-control possibilities of Organized Lubrication. To arrange for a free showing of either, or both, just check and mail the coupon.

*Field surveys prove lube oil dilutes cutting oil in 7 out of 10 automatic screw machines.

Tune In: Texaco Huntley-Brinkley Report, Mon. Through Fri.-NBC-TV

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Please send information about:

- ☐ The "Cleartex Cure," including free booklet, "Cleartex in Automatic Screw Machines."
- ☐ Film on selection and use of cutting oils.
- ☐ Film on cost-control possibilities of Organized Lubrication.

Name_____

Company_____

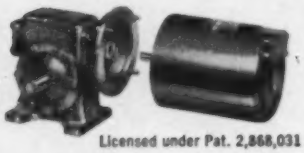
Position_____

Address_____

PERFECTION
Flanged & Motorized Worm Gear
SPEED REDUCERS

Perfection Motorized Worm Gear Speed Reducers are available in 956 different combinations, with ratios ranging from 5 to 1 to 60 to 1, and in capacities from 1/6 H.P. to 5 H.P. This line of complete Motorized Reducers is available from stock for immediate delivery. Perfection "C" flange Reducers may be ordered complete with motor or without motor, to be used with a motor of your own choice.

Flanged motor reducers offer the maximum in compactness, rigidity and adaptability. Through the use of standard NEMA face mounted motors, complete interchangeability between motors is provided. Motor maintenance is possible without disturbing the drive and reducer. Motor assembly is fast and positive with no alignment problems.



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AMERICAN STOCK GEAR DIVISION
PERFECTION GEAR COMPANY **HARVEY, ILLINOIS**

NAMES IN THE NEWS

motive Division. He has been assistant general manager of the Plymouth-Valiant Division of Chrysler Corp since January 1957.

Keuffel & Esser Co, Hoboken, NJ, has elected **Alfred E Busch** president. Formerly vice president, he succeeds **Carl W Keuffel** who has retired

Lake Erie Machinery Corp, Buffalo, has promoted **Elmer A Rich III** from vice president and general manager to president of the company which is a subsidiary of Bell Intercontinental Corp.

Norton Co, Worcester, Mass, has appointed **Thomas D Bushman** product manager of semiconductor processing equipment at the Machine Tool Division.

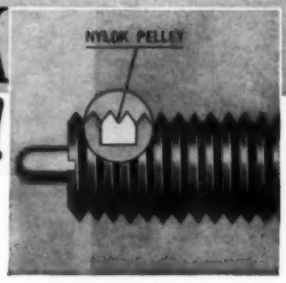
Owatonna Tool Co, Owatonna, Minn, has appointed **S L Richmond** sales manager of the Tools and Equipment Division. He was formerly west coast sales manager for Curtis Industries Inc, manufacturer of automotive parts, key machines, and blanks.

Ford Motor Co has named **John S French** general manager of the new Motorcraft Division. He will continue temporarily as general manager of the Hardware and Accessories Division.

Thor Power Tool Co, Aurora, Ill, has announced two executive appointments in the administration of its foreign manufacturing subsidiaries. **Clarence B Bergren,** formerly manager of industrial sales, has been transferred to Tynemouth, England, as managing director of Thor Tools, Ltd (formerly Armstrong-Whitworth), British subsidiary. **Samuel P Gartland,** previously regional industrial sales manager with headquarters in Indianapolis, has been

(Continued on p 281)

NOW all VLIER Spring Plungers are available with NYLOK at no extra cost!



Nylok-fitted bodies are self-locking; eliminate need for checknuts or other secondary locking devices.

Whether you use Vlier Spring Plungers on tooling, or for original equipment applications, you'll like this new self-locking feature.

Each Vlier Spring Plunger body is permanently fitted with a tough, resilient nylon pellet which slightly protrudes above the major thread diameter. As the plunger is inserted in the tapped hole, this pellet is *compressed* (not cut), exerting a spring-like pressure on one side of the plunger body. This *constant* lateral thrust wedges the mating threads together, assuring a *positive* lock that remains vibration-proof regardless of cyclic loads.

PERFECT FOR USE WHERE PERIODIC ADJUSTMENTS MUST BE MADE—The self-locking feature is effective whether the body is seated or not, permitting the Vlier Spring Plunger to be easily and accurately adjusted as required...cannot back off or be shaken loose once set.

RE-USEABLE MANY TIMES—When the Vlier Spring Plunger is removed, the Nylok pellet strives to return to its original shape. Parts can be used numerous times before any locking pressure is lost.

NO EXTRA COST FOR SELF-LOCKING FEATURE—All standard Vlier Spring Plungers are now available with the self-locking feature at no increase in price! However, all models may still be ordered without Nylok.

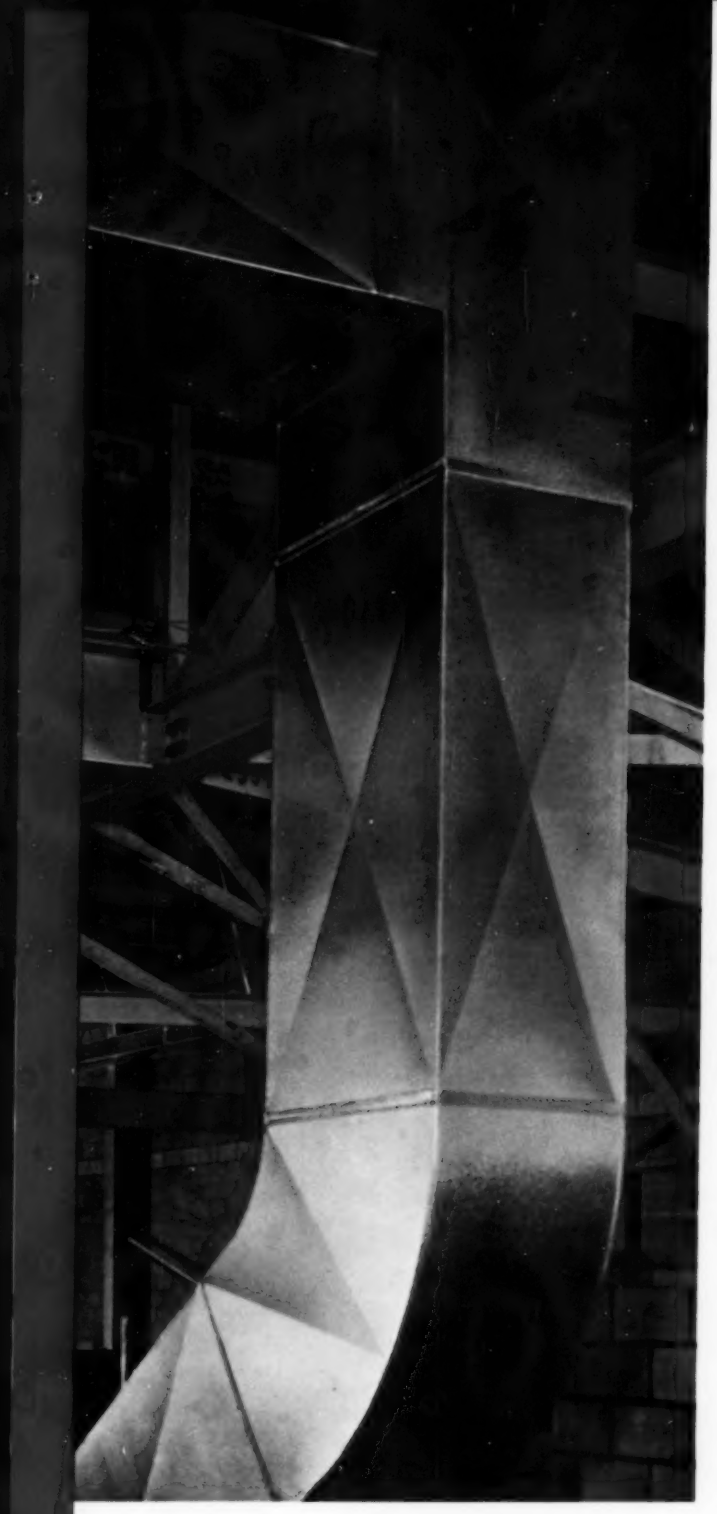
Your Vlier distributor now has Nylok-fitted Vlier Spring Plungers on his shelf. Order a supply today.

VLIER
Engineering Corporation
A subsidiary of Barry Wright Corporation
8900 Santa Monica Blvd., Los Angeles 46, California

Link-Belt

Youngstown

galvanized sheet



tufkote

brand-new brand in hot dipped quality galvanized steel sheet

You can tell Youngstown **tufkote** by the bright new sparkle of its fine zinc coat. And durable **tufkote** performs as well as it looks. You can test it any way you want to prove its workability. Bend it to see how easily it forms. Draw it to watch its ductility.

tufkote comes from the newest, finest galvanizing line in the industry. The new 848-foot line at our Indiana Harbor plant incorporates every modern facility insuring zinc coated sheets in both cut lengths and coils, unequaled in superior quality.

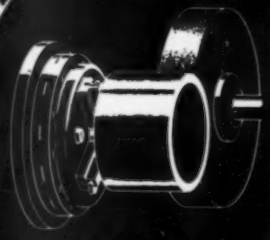
tufkote offers the best combination of strength and bendability. You'll never see formation of oxide or dross. No "spikes" or "icicles". Nor will it flake or peel when you use it. **tufkote** will pass your stiffest inspection because it is carefully watched from ore to open hearth and rolling and through the precision Sendzimir zinc coating process itself.

Specify new Youngstown **tufkote.** Get the exact coating, finish and adherence your specs call for. And you get fast, dependable service that makes Youngstown higher quality an even greater value.

Youngstown – growing force in steel

For full details on new **tufkote** galvanized sheet, write, Dept. 10-B
The Youngstown Sheet and Tube Company, Youngstown, Ohio

New ERICKSON
Air Operated or Manual
DIAPHRAGM CHUCKS
for utmost accuracy and concentricity



- *greater jaw rigidity*
- *internal or external chucking*
- *easy diaphragm replacement*
- *eliminates air leakage.*

**Patented and patents pending.*

Basic design of new Erickson Air Operated Diaphragm Chucks* offers distinct advantages in three important areas:

Higher Production Speeds. Reduction in weight over conventional designs means lower inertial forces. Reduction in overhang reduces centrifugal forces; cleats provide sufficient counterbalance. Conventional compression-type adjustment for locating jaws gives greater jaw bearing and maximum rigidity for highest speeds.

Precision Performance. Traditional Erickson precision design and construction for utmost accuracy and concentricity.

Lower Maintenance. Diaphragm construction, with hold-down screws located on flat outer edge of diaphragm, reduces stress concentration and eliminates need for clearance holes through diaphragm for mounting bolts. Design gives higher yield point for diaphragm longevity and easier replacement. O-ring seals eliminate air leakage. Sludge slots around periphery promote escape of grinding dust and other maintenance-causing particles. AA-5696

Write for your free copy of "Erickson Air Operated Diaphragm Chuck" today.

ERICKSON TOOL COMPANY

34350-10 SOLON ROAD • SOLON, OHIO

COLLET CHUCKS • EXPANDING MANDRELS • AIR-OPERATED CHUCKS • FLOATING HOLDERS • TAP CHUCKS
AUTOMATIC INDEXING • MASTER SPACERS • DIAPHRAGM CHUCKS • PUSH-ON ARBORS • QUICK-CHANGE HOLDERS
EXPANDING COLLETS • END-CLAMPING CHUCKS • AIR CYLINDERS (allowing stock to pass through)
EXPANDING JAW MANDRELS • SPECIAL HOLDING FIXTURES

912

◀ CIRCLE 431 READER SERVICE CARD ▲ CIRCLE 432 READER SERVICE CARD

transferred to Turin, Italy, as managing director of FIAP, newly acquired Italian manufacturing subsidiary.

Caterpillar Tractor Co, Peoria, Ill, has appointed **Lee L Morgan** vice president in charge of the Engine Division. He succeeds **Henry H Howard** who has retired. Mr Morgan was formerly manager of sales development and was elected a vice president of the company Mar 28

Standard Tool & Manufacturing Co, Lyndhurst, NJ, has named **L K Shepard** vice president, sales. He has been with the firm since 1958 with responsibility for sales and new product development.

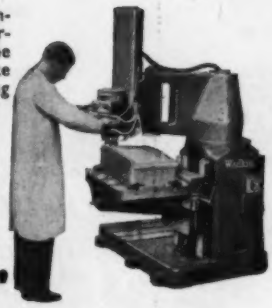
Anderson Corp, Worcester, Mass manufacturer of brushes and hole saws, has elected **William C Arthur** president and chief executive officer. Formerly vice president, he replaces **Brent R Anderson** who becomes board chairman and consultant.

Cutler - Hammer, Milwaukee, has named **F A Wright** purchasing agent. Formerly general sales manager, he replaces **B M Horter,** director of purchases, who will retire at the end of the year after 46 years of association with the firm.

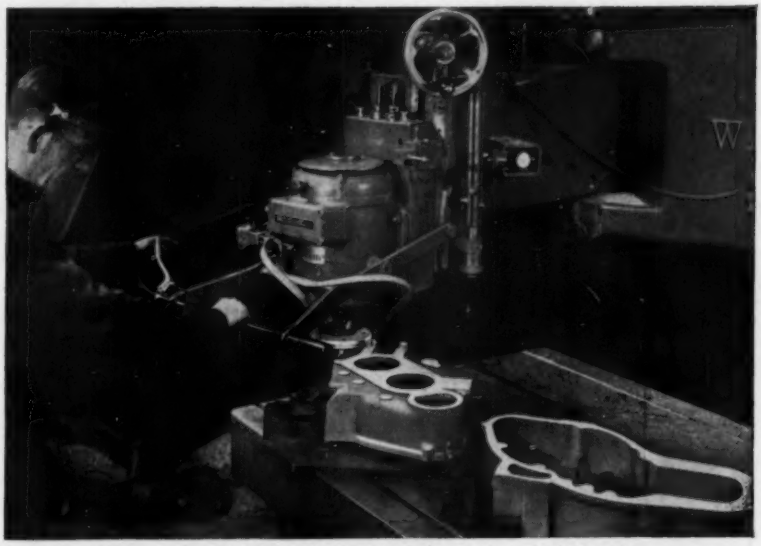
Veeder-Root Inc, Hartford, Conn, has named **J Davidge Warfield** vice president, sales. He moves up from the post of marketing manager.

Pall Corp, Glen Cove, NY, has realigned executives to fill five new posts in the company and its divisions. **Sidney Krakauer,** vice president of Pall, has been appointed president of **Fibrous Glass Products Inc. Henry Petronis,** vice president, manufacturing of the firm, has taken on the added duties of president of **Hollinger Machine Co Ltd,** Montreal

The medium capacity machine, type L.C.6 with power-operated rise and fall to the head, integral base plate and rising and falling tilting table.



Milling ALUMINUM *up to ten times faster than by any other means!*

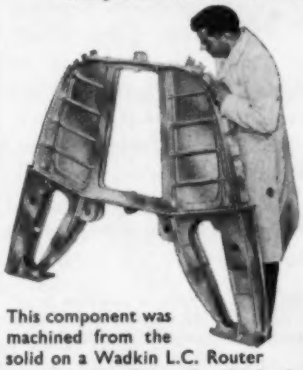


Wadkin Heavy Duty Articulated Arm Router, L.C. face-milling gearbox end covers.

For rapid, precision milling of aluminum components Wadkin Articulated Arm Routers are way ahead. Not only do they boost output and cut production costs, but their price is relatively low as compared with conventional millers. Wadkin machines employ new high speed milling techniques. With cutting speeds up to 18,000 r.p.m., low tooth loading of the cutter, and only light clamping of the component, face-milling is done in a fraction of the time normally taken. On pocketing operations, too, an easily obtained metal removal rate of 20 cubic inches per minute cuts production times down to an absolute minimum.

Three models are available: type L.C. with either 6′ 0″ or 8′ 0″ reach and a smaller type L.C.6.

Write today for Catalog 945 from your nearest Wadkin Agent, listed below.



This component was machined from the solid on a Wadkin L.C. Router with a saving of many hundreds of hours over conventional milling methods.

Wadkin

HIGH SPEED MACHINE TOOLS

Supreme Machine Tool Corp., 130-40 180th Street, Springfield Gardens, Jamaica 34, N.Y.
Machinery Sales Co., 2838 Leonis Blvd., P.O. Box 58362, Los Angeles (Vernon) 58, CAL.
Wigglesworth Machinery Co., 60 Border St., P.O. Box 166, East Boston 28, MASS.
Machinery Associates, 500 Piedmont Avenue, Atlanta 8, N.E., GEORGIA.
Childs Machinery Inc., P.O. Box 700, Atlanta 1, GEORGIA.
Machine Tool Sales Company, 1809 Canton St., Dallas 1, TEXAS.

THESE BENEFITS ARE YOURS

when your drills are sharpened on

the Model 100-A

WINSLO-MATIC DRILL POINTER

- ...extremely true, close-tolerance holes within .001 of drill size (even in the new super-metals) since drill points are concentric within .0002.
- ...precision conventional chisel type drill points as well as **helical** (self centering) drill points essential to optimum performance on **tape controlled** drilling machines.
- ...increased production from every drill because drills last up to twice as long.
- ...elimination of most reaming requirements.
- ...faster, more precision drilling with fewer rejects.

20" diameter grinding wheel

Get these benefits...and many more with the completely automatic WINSLO-MATIC DRILL POINTER. Handles drills from 1/32" to 1½" diameters.

Write for descriptive literature and check for yourself the many exclusive advantages of the versatile WINSLO-MATIC Drill Pointer.

Winslow PRODUCT ENGINEERING CORPORATION
47 ST. JOSEPH STREET • ARCADIA, CALIFORNIA
CIRCLE 434 READER SERVICE CARD

WAGNER COLD SAW
MODEL WKMAL200

PRODUCTION EXAMPLE
Brass Rod ¾" dia.
Approx. 4500 cuts per hour
Aluminum Rod, 1" dia.
Approx. 5000 cuts per hour

This high speed cold sawing machine, with loading table assures true automation. It provides automatic loading, infeeding, squaring, piece for piece cutting, discharge of finished pieces, and ejection of scrap ends. Magnetic valve control releases new bar from table to infeed track. Cycle continues automatically until all pieces are accurately cut to length.

Other models available in capacities to 40" See our exhibit at ASTME Show — Booth #2501 at N. Y. Coliseum, May 22-26th.

167 MILL LANE — MACHINE TOOLS — MOUNTAINSIDE NEW JERSEY

ALBERT KLINGELHOFER
MACHINE TOOL CORP.

NAMES IN THE NEWS

manufacturer of water treatment equipment. **Joseph A Whitwell,** formerly vice president, sales, has been elected vice president, sales development, and will devote himself entirely to new products. **Charles H Hacker,** formerly chief engineer, has been named general manager of **Micro Metallic Division,** which produces industrial filtration equipment. **John A Farris** has been promoted to manager of sales and engineering liaison for **Aircraft Porous Media Inc,** supplier of filters to the aerospace industries.

Detroit Power Screwdriver Co has appointed **Donald P Lamb** general sales manager. He was formerly supervisor of field sales and engineering

R C Mahon Co, Detroit-based steel fabricator, has elected **Robert C Palmer** president to succeed **Walter F Sheetz** who will serve as board chairman and chief executive officer. Mr Palmer recently resigned as president of Ingalls Iron Works of Birmingham, Ala. **Charles M Hargraves,** associated with Mahon for more than 30 years, and a specialist in automated metal-finishing lines, has been named manager of the company's Industrial Equipment Division which supplies specialized metal-cleaning and painting equipment and complete finishing systems.

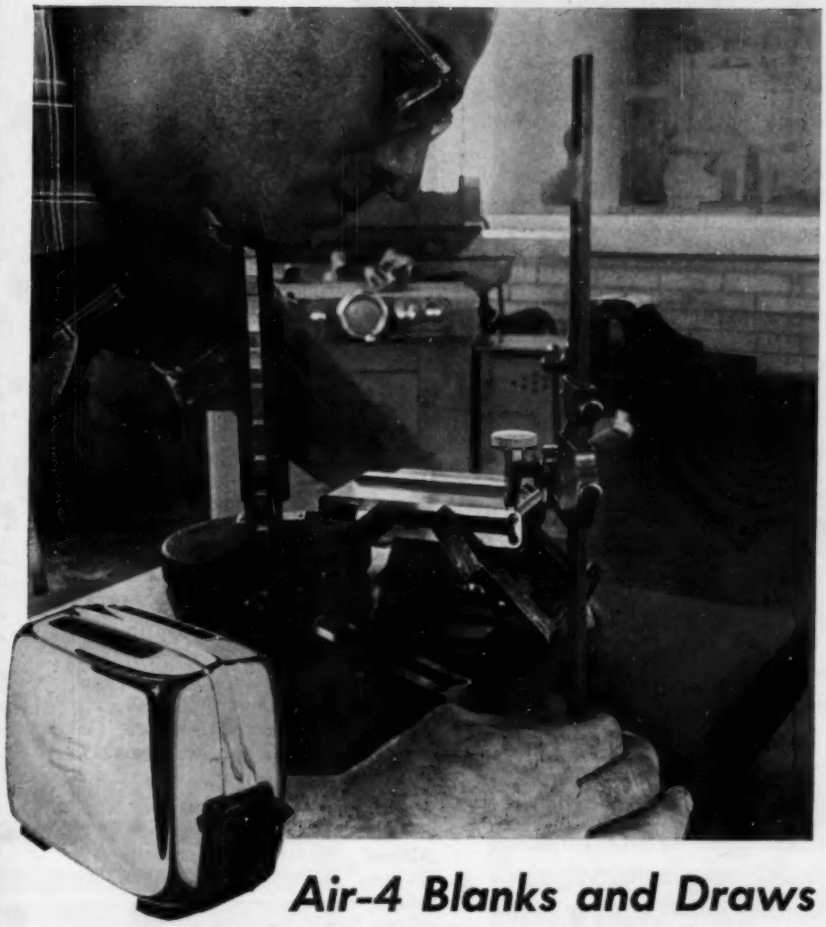
Heli Coil Corp, Danbury, Conn, has appointed **William Bastian** head of its new Marketing Division. He has been serving as assistant to the president of the company.

Rockwell-Standard Corp, Coraopolis, Pa, has elected **Harry Fante** and **F W Parker Jr** to the posts of executive vice presidents of the company. Mr Fante, a vice president, has for many years headed the Automotive Seating Group. Mr Parker, also a

Steel
for Strength
. . . Economy
. . . Versatility

Tool Steel Topics

BETHLEHEM STEEL



Air-4 Blanks and Draws Bread Slots in GE Toaster Shell

This blanking and drawing die, made from Bethlehem Air-4 tool steel, forms bread slots in .030-in. steel sheet for a General Electric automatic toaster. Hardened to Rockwell C 59, the die sections were made by Yarema Bros. Tool & Die Co., Allentown, Pa. They were pleased with Air-4 for two reasons—minimum distortion during heat-treatment, and easy machinability.

Hardens in Air at 1550 F

One of the big advantages of Air-4, Bethlehem's new free-machining medium-alloy tool steel, is its ability to harden in air at low temperature — about 1550 F. Air-4 has exceptional free-machining characteristics because just the right amount of lead has been added. It has high wear-resistance, excellent toughness, and deep-hardening properties — everything you need for economical tool service.

Our booklet on air-hardening steels includes full data on Air-4. For your copy, write to Publications Department, Bethlehem Steel Company, Bethlehem, Pa. Ask for Booklet 548.

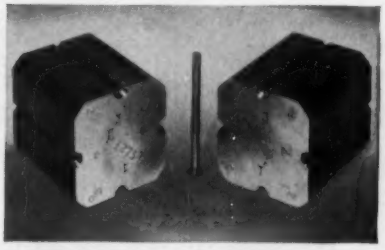
BETHLEHEM TOOL STEEL ENGINEER SAYS:

Lehigh H Is the Work-Horse Of the Cold-Extrusion Industry

Bethlehem's Lehigh H, a high-carbon, high-chromium (AISI type D-2) tool steel, is the most widely used tool steel in the cold-extrusion industry. And for good reasons. Lehigh H has an unusually good combination of properties: high compressive strength, deep hardenability, and high resistance to wear.

Lehigh H is used for a wide variety of cold-extrusion tools, such as punches and mandrels which are subject to compressive loads or abrasion. Whenever it is used for containers, bushings, or similar parts which are subjected mainly to tensile loads, it is supported by an external shrink ring.

Cold-extrusion tools of Lehigh H are usually made to a hardness of Rockwell C 58-60. Occasionally they are tempered back to C 55 to avoid breakage. Using a hardness above C 60 is not recommended, because such a hardness is obtained only at a sacrifice of proper tempering.



COLD-HEADING DIE STEEL SPEEDS HEADING OF SCREW BLANKS

These gripper dies are used by Southern Screw Company in forming blanks from steel wire. The dies, made of Bethlehem Cold-Heading Quality tool steel, produce about 150,000 blanks before redressing is required. Bethlehem Cold-Heading steel resists shock because it is carefully controlled for hardenability. It also has a carbon range selected to give good wear-resistance and high toughness.

CIRCLE 436 READER SERVICE CARD

New Hamilton electric gages control automatically to 0.0001"

low cost multi-dimension gaging saves time, eliminates inspection errors

New, versatile Hamilton electric indicator gages provide faster, simpler and highly accurate gaging for semi-automatic or automatic post-process inspection, or in-process machine control. Operator error is eliminated by the use of lights which quickly and accurately indicate out-of-tolerance dimensions. Uniformly closer tolerances are assured. Inspection time is reduced by simultaneous measurement of all critical dimensions.

Hamilton electric gaging systems include electric indicators, gage holding fixtures and control units. For complete information on Hamilton electric and mechanical gages, write for Data File AM-5.

HAMILTON
WATCH COMPANY **Industrial Products Division**

Lancaster, Pennsylvania

vice president, has been in charge of the firm's largest operating division, the Transmission and Axle Group.

Emhart Manufacturing Co, Hartford, Conn, has elected **Everett A Cooper** a vice president. He has been serving as administrative assistant to the president since joining the company in 1957

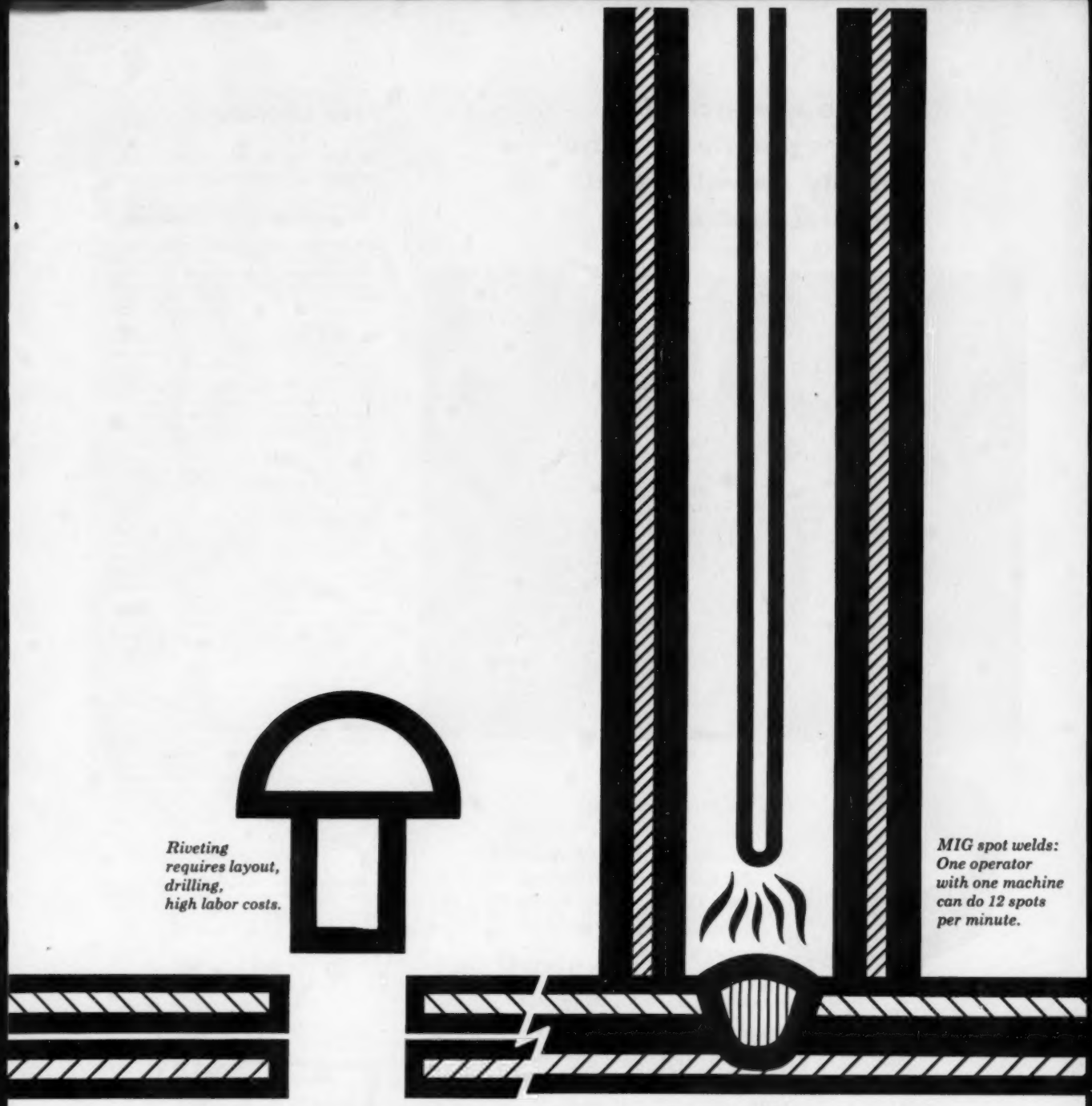
American Welding Society has elected **A F Chouinard** president. He is director of research and development, **National Cylinder Gas Co. Jay Bland,** manager of welding development at **General Electric Knolls Atomic Power Laboratory,** Schenectady, NY, has been elected vice president of the Society.

Gleason Works, Rochester, NY, has appointed **Morgan A Gage** assistant director of industrial relations. He has been a sales engineer since 1953.

Howe Precision Products Co, Royersford, Pa, has named **Arthur B Allison** president. The company is a division of Howe Sound Co. Mr Allison was formerly vice president of the five manufacturing facilities recently joined to form Howe Precision Products.

Beryllium Corp, Reading, Pa, has named **John R Steele** manager of beryllium metal development. He was formerly assistant manager of the Metallurgical Division of Westinghouse Electric Co's Air Gas Turbine Division in Kansas City.

American Foundrymen's Society has elected **Albert L Hunt** president for 1961-62. Mr Hunt is executive vice president, **Superior Foundry Inc,** Cleveland. Elected AFS vice president is **John A Wagner,** president of **Wagner Castings Co,** Decatur, Ill.



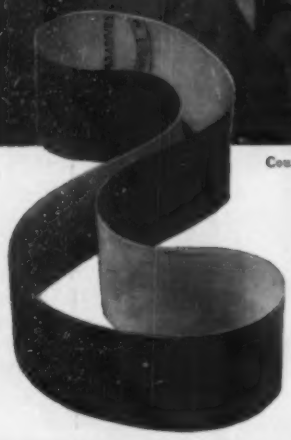
How? Ask Olin:

Olin Aluminum Research has now adapted the MIG welding process for spot welding aluminum; overcoming the old problem of inconsistent results. Where properly designed joints are used, the strength of MIG spot welds is as high as or higher than those of rivets or resistance spot welds, at about half the cost of riveting. No matter what you fabricate – aluminum truck trailers, boats, building products, or the like, Olin Aluminum's technical service may be able to help you adapt their MIG spot welding technique. If you're interested in the higher production rate, decreased labor cost and low equipment investment that makes MIG spot welding 50 to 100 per cent cheaper than riveting, call your local Olin Aluminum Sales Office and our expert metallurgical and technical service will be on the way.

Olin
ALUMINUM
400 PARK AVE., NEW YORK 22, NEW YORK

for a superior finish when centerless grinding specify Jewel Brand abrasive belts

Courtesy of Production Machine Company, Greenfield, Massachusetts



The 486 Centerless Grinder is designed for precison grinding and finishing small parts by plunge cut or thru-feed methods. It is equipped with a ground steel contact roll or a rubber faced contact roll for low micro-inch finishing.

No matter what the grinding method or the operation to be performed, there's a Jewel Brand abrasive belt designed for it. That's why experienced operators specify Jewel Brand. They know they'll get the right bond, the right backing and the right grain.
Next time, why don't you specify Jewel Brand?

For a trial run, call your industrial distributor or write: Abrasive Products, Inc., South Braintree 85, Mass.

JEWEL BRAND

COATED ABRASIVES

belts • rolls • sheets • discs • specialties

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 HORIZONTAL BORING MILLS—*Cincinnati Gilbert Machine Tool Co, 3366 Beekman St, Cincinnati 23, Ohio.* 6-page bulletin 1260 summarizes major features of F Series table-type 3½ and 4-in. machines. These include two types of pendant controls, automatic positioning, tracer controls, numerical controls. Construction details illustrated; accessory equipment described; specifications tabulated.

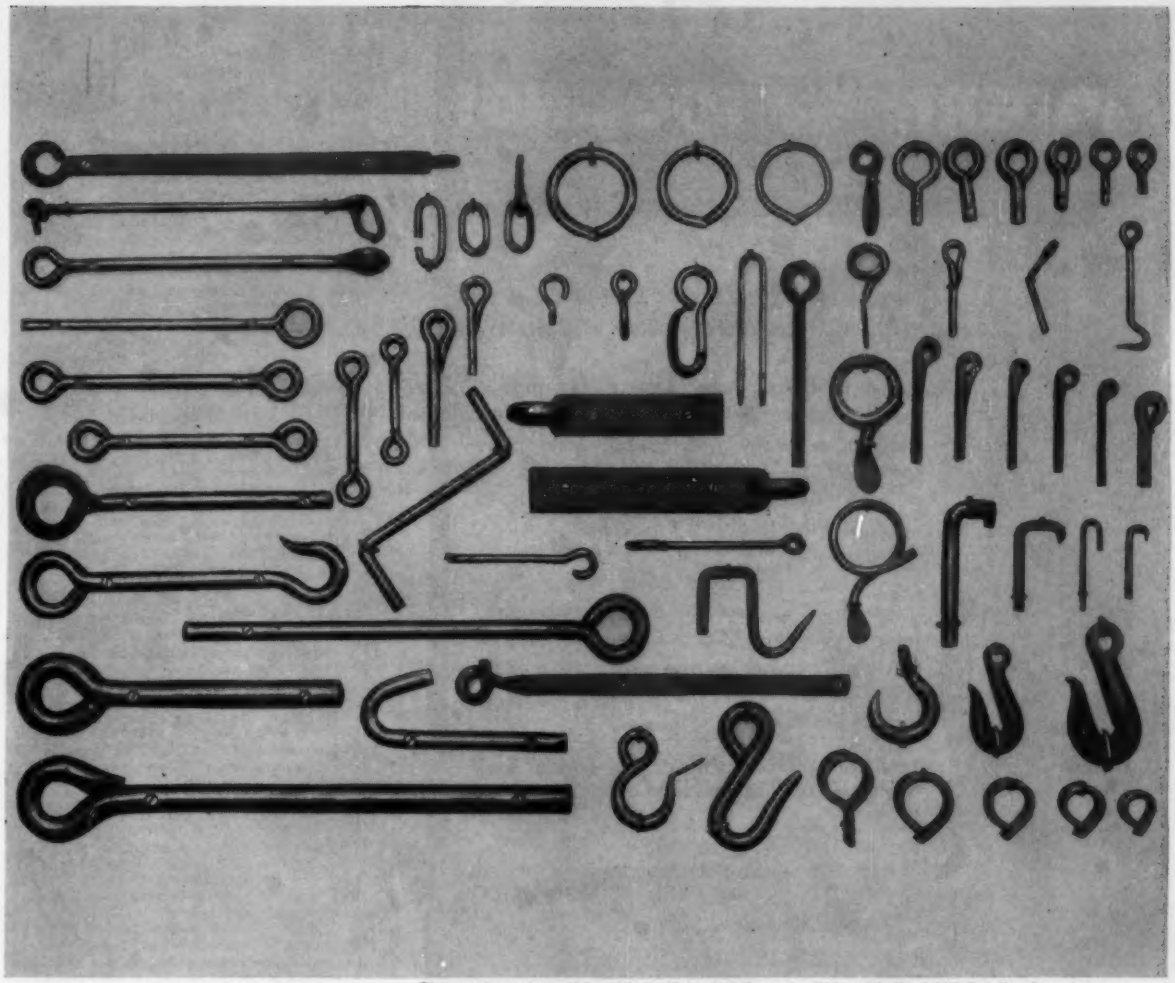
2 HYDRAULIC PRESSES—*French Oil Mill Machinery Co, Piqua, Ohio.* 36-page catalog P 95 pictures and describes company's lines of hot plate presses, molding presses, metal forming and drawing presses, metalworking presses, plastic compression molding presses. Miscellaneous hydraulic data provided, engineering tables included.

3 MILLING MACHINE SPINDLE—*Cincinnati Milling Machine Co, Milling Machine Division, Cincinnati 9, Ohio.* Illustrated publication No. M-1963-2 describes a 3-hp independent overhead spindle that is a complete self-contained unit and includes a streamlined rectangular overarm which replaces the standard Cincinnati Dynapoise Overarm on 203-10 ML and 205-10 MI milling machines. Eight changes of spindle speeds are available from 100 to 1530 rpm or 150 to 2250 rpm.

4 7-IN. GRINDER—*Delta Power Tool Division, Rockwell Manufacturing Co, 488 N Lexington Ave, Pittsburgh 8, Pa.* Bulletin pictures and describes the new Delta grinder which features "Twin Lite" safety shields that contain double-strength, shatter-proof glass to protect the operator's eyes even if he fails to wear protective goggles. Inside the shields, bayonet bulbs are shaded to prevent glare while illuminating the face and both sides of the wheel.

5 HIGH - SPEED DRILLPRESSES — *Electro-Mechano Co, 241 E Erie St, Milwaukee, Wis.* 4-page illustrated bulletin gives data on standard machine, drilling motors, and multiple head base. These ma-

AM/MM



Shown above is a wide variety of applications possible with the W-W Eye Bender.

BENDING PROBLEMS? Investigate the Williams-White Hydraulic Eye Bender

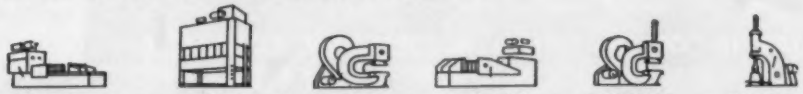
This fast, universal machine, expressly designed for economical bending of oval or round eyes, hooks or simple right angles, will handle stock to ¾" in diameter around a 1" mandrel or 1" diameter stock, hot, around a 1½" mandrel. Compact in size and economical to operate, this versatile machine is capable of producing 1,200 completed bends per hour. Photo shows its wide versatility.

Using interchangeable dies, a vast number of different bends can be made on the same machine. An inching arrangement allows fast die change to maintain peak production rates.

For additional information on how to achieve maximum production and economy on your bending operations, get your copy of Bulletin No. 71 or write, detailing your bending problems.

WILLIAMS-WHITE & CO 600 Third Avenue, Moline, Ill.

the measure of Performance Reliability for more than a century



BULLDOZERS • PRESSES • SHEARS • BENDERS • PUNCHES • HAMMERS

1M61

modern MACHINES *demand*

MODERN *solid carbide* TOOLING!

Jarvis SOLID CARBIDE GIVES MAXIMUM EFFICIENCY AND ECONOMY!

Forward-thinking management demands a tool in step with the times—a tool that delivers accuracy with SPEED!—and pays for itself by producing *more* for *longer* periods. That's why the big swing is to Jarvis carbide tools!

Jarvis tools are solid carbide—skillfully engineered to perform to ten-thousandths tolerances—and afford all the benefits of increased production and guaranteed economy inherent in carbide. Specify Jarvis... it's the *profitable thing to do!*

Jarvis designs and manufactures Special Tools for specific applications. Send details for prompt quotation.

MULTIPLE SPINDLE DRILLING & TAPPING HEADS
HSS & CARBIDE TOOLS
TORQ-MATIC TAPPING HEADS
FLEXIBLE SHAFTS & MACHINES
HIGH SPEED STEEL TAPS
LEAD SCREW TAPPING HEADS

JARVIS CORPORATION • MIDDLETOWN, CONNECTICUT

SEE US AT A.S.T.M.E. SHOW BOOTH 3219

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To order any of these bulletins, circle corresponding number inside back cover.

chines are used for printed circuit work, instrument manufacturing, and secondary screw machine operations.

6 FATIGUE TESTING MACHINES—*Riehle Testing Machines Division, American Machine & Metals Inc, East Moline, Ill.* 12-page bulletin RF-2-61 describes Riehle-Los hydraulically actuated units. Capable of testing material specimens and complete structural components, they can also be used for conventional static testing. Optional programmer automatically varies load control points and frequency. Hydraulic flow control charts, specification tables, accessory controls included.

7 GEAR SHAVING MACHINE—*National Broach & Machine Co, 5600 St Jean, Detroit 13, Mich.* 12-page bulletin S-56-1 presents illustrated information on Model GCI Red Ring machine designed for conventional shaving of gear teeth to the elliptoid form. It handles both spur and helical gears from ½ to 18-in. PD.

8 TESTING MACHINES — *Testing Machines Inc, 73 Jericho Turnpike, Mineola, NY.* 20-page selected listing of testing machines for all industries has 69 categories of physical testing such as abrasion, hardness, moisture, impact, tensile, and 64 additional categories; total of 461 machines is covered. Equipment has been compiled from worldwide sources including units manufactured by TMI and many other instrument and testing machine manufacturers. Price information included on all.

9 AUTOMATIC MULTIPLE OPERATION MACHINES — *Globe Tapping Machine Co, 1251 Central Ave, Bridgeport 7, Conn.* 19-page catalog B describes how automatic machining such as drill and tap, ream and counterbore, mill and face, trepan and outside threading may be combined with each other or with screw assembly, inspection, or any of a wide variety of operations on hopper fed blanks. Applications discussed in detail explain how quality standards may be improved and labor costs reduced by using simple

AM/MM

"Of course you're entitled to your opinion . . . have I ever asked for it?"

free analysis of your tape requirements

point-to-point or continuous path positioning

dial-in control of 2 axes, or tape control of 2, 3, or 4 axes

tape control of all speeds, feeds, depth, and clamping

exclusive Di-Matric controls provide infinite machining cycles

tape-revolved tables with infinite positions or radial feeding

automatic power tool lock with hardened and ground taper

automatic tape controlled tool changers available

all drive screws in center of guideways for best accuracy, least wear

tape is read during positioning; no delays

simple switching from tape to pendant controls

heavy-duty, rigid structural design

repeatability within plus or minus .0001"

wide range of sizes, both table or floor type

14 reasons to consider tape-controlled Gilberts

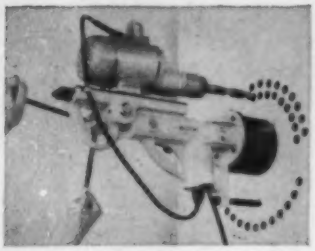
Summarized here are the main reasons you should consider Cincinnati Gilbert's numerically-controlled 4" and 5" horizontal boring mills. We suggest a letter or phone call for complete information—or, better yet, a visit to the plant to see an actual demonstration. The Cincinnati Gilbert Machine Tool Co., 3366 Beekman Street, phone Kirby 1-4815, Cincinnati 23, Ohio.

GILBERT

BUX PORTABLE DRILL PRESSES

NEW!

BUX RADIAL POSITIONER The ECONOMICAL answer to ALL your drilling problems!



For faster, more accurate drill bit position on the workpiece, Overhead, Vertical, or Horizontal drilling, the BUX Radial Positioner models are just the thing.

No other portable magnetic drill press is so versatile!

Simple 1/4 turn of the handle releases drill for full 330° radial action and/or 1-1/8" lateral movement.

...and POWER FEED too!

Save on manpower with BUX-MATIC portable magnetic drill press with Automatic Power Feed. One man can operate up to 3 units simultaneously—save on operator fatigue, increase production and twist drill life.

BUX-MATIC is portable too—weighs less than 80 pounds!

BUX magnetic products

for FREE Literature and Name of nearest Dealer . . . Write:

BUX MAGNETIC PRODUCTS, INC.
1355 N. 10th St. San Jose 12, Calif.

CIRCLE 443 READER SERVICE CARD

Two Hardness Testers in a Single Instrument

The new Wilson Rockwell TwinTester combines in one instrument the functions of both a Rockwell and a Rockwell superficial hardness tester. Designed primarily for use in such areas as tool departments, maintenance repair shops and laboratories, the TwinTester offers many outstanding features.

Large direct-reading dial is marked with B and C scales for Rockwell hardness, and N and T scales for superficial Rockwell hardness readings. Just one zero set position for all scales.

Easy to operate, the TwinTester can be changed from Rockwell to Rockwell superficial testing in seconds.

Complete equipment includes cowl, ball penetrator for B and T scales, Rockwell test blocks, anvils, dust cover and protective sleeve set.

A complete line of Wilson Rockwell instruments is available, including semi and fully automatic models. Wilson "Brale" Diamond Penetrators assure perfect readings every time.

Write for details—Ask for Catalog RT-58. It gives complete information on the TwinTester as well as on the full line of Wilson Rockwell hardness testers.

Wilson "Rockwell" TwinTester

WILSON "ROCKWELL" HARDNESS TESTERS

ACCO

Wilson Mechanical Instrument Division
American Chain & Cable Company, Inc.
230-B Park Avenue, New York 17, New York

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

tools and unskilled operators. Equipment covered includes dial index machines; conveyor index machines; multi-spindle high-production automatic drilling and tapping machines.

TOOLS AND ACCESSORIES

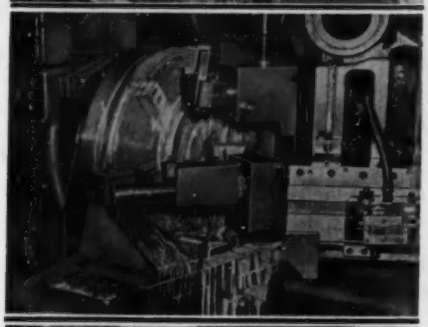
● AIR GAGING—*Standard Gage Co, Poughkeepsie, NY.* 32-page catalog 61, an engineering and purchasing guide, is designed as a source of basic design data for the gage engineer and to provide complete ordering information for purchasing personnel. These air gages allow maximum application of the building block principle to all gaging requirements from the simplest forms of manual gaging to the most complex post-process, in-process, or automatic gaging units. Illustrated index covers wide variety of instruments and accessories. Request direct on company letterhead.

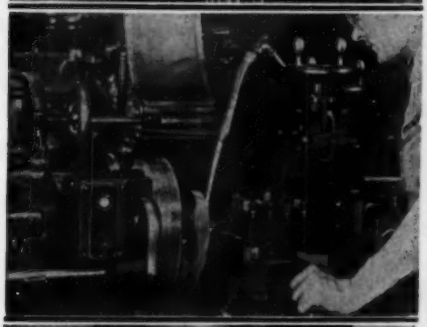
10 TOOLS AND ACCESSORIES — *Beaver Tool & Engineering Corp, 500 West County Rd, Gaylord, Mich.* 198-page general catalog (ring bound for additional insertions) contains complete information on Ogesto Quick Change and Beaver Quick Change—two lines of shank milling, drilling, and boring accessories; Ogesto Adjustable Quick Change tools designed for tape control or conventional machines; Calibore precision adjustable boring units and Calibore precision adjustable boring insert units for semi-finish and finish boring operations; over 450 boring bars, boring heads, and boring bar blanks with Ogesto Quick Change, Beaver Quick Change, Morse taper, NMTB, and straight shanks; arbors (style A, B, and C), spacing collars, bearings and nuts; complete line of taper shank milling, drilling, and boring accessories; inserted blade cutters.

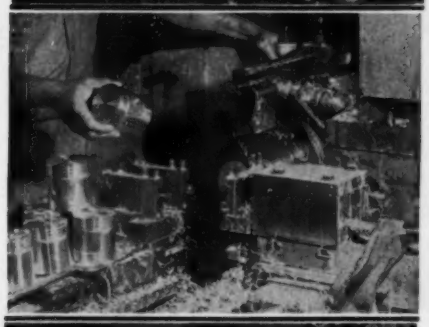
11 DIAL INDICATORS — *Fairbanks, Morse & Co, Scale Division, 19-01 Route 208, Fair Lawn, NJ.* 10-page publication ASB 300.11 describes the flexibility in design and utilization of these cabinet dial and pillar dial indicators. Features common to both types are swivel head, easy-to-read chart, and open-face, center indicating tare. Cutaway photos show the full-floating, double pendulum Floaxial mechanism.

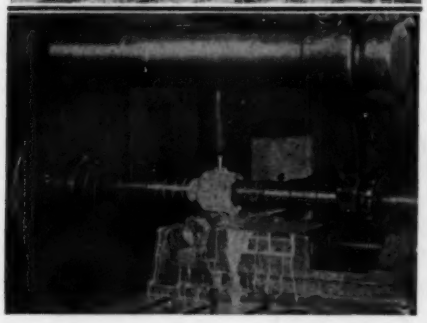
AM/MM

"I figured I'd make them so tired of clocks that they'd never want to see another one."









MACCO 472 MPA

THE ONE SOLUBLE CUTTING LUBRICANT THAT WON'T GO RANCID*

WILL HELP YOU

INCREASE TOOL LIFE 25% OR MORE

***GUARANTEED not to turn rancid under any circumstances, AND it's Ideal for MACHINING METALS on ALL TYPES of EQUIPMENT**

472 MPA is a proven product! In plant after plant, economy-minded production people recognize the need for and wisdom of extending tool life. And they do something about it. They use MACCO 472 MPA! Experience has taught them that MACCO 472 MPA will actually increase tool life by 25%, and more! They've found this exclusive Macco development really does possess superior cutting qualities. So, for many reasons MACCO 472 MPA is a product of tomorrow that's here today . . . to help fight the battle against rising costs. Call on your Macco engineer. He'll show you how you can solve some cost problems.

THE METALWORKING INDUSTRY LOOKS TO MACCO FOR LEADERSHIP

MACCO PRODUCTS COMPANY

9201 am S. SANGAMON ST., CHICAGO 20, ILLINOIS
PRESCOTT 9-0800

CIRCLE 445 READER SERVICE CARD

NEW GORTON RAIL-TYPE MILL

Designed for numerical control!

To satisfy the exacting requirements of numerical control, Gorton announces the all-new Double-Column Rail-Type Milling Machine. Designed for positioning and continuous path contouring system applications.

Features

- Precision ball bearing screws with preloaded nuts
- Positive anti-backlash drive system
- Bed-type design
- Electric or hydraulic motor control of axis movement
- All way surfaces guarded
- Unique air-balanced vertical slide
- Various types of heads available
- Spindle speed selection — manual or programmed
- Automatic lubrication

Specifications

Table	22" x 32"
Table Travel	(X Axis) 24"
Rail Slide Travel	(Y Axis) 32"
Vertical Slide Travel	(Z Axis) 10"
Quill Travel	(Manual) 4"
Spindle Speeds	80-10,000 R.P.M.
Clearance between Columns	36"

See this machine in operation at the Thompson Ramo Wooldridge Booth, ASTME Show

A Gorton Product, the Finest of its Kind!

GEORGE GORTON MACHINE CO.

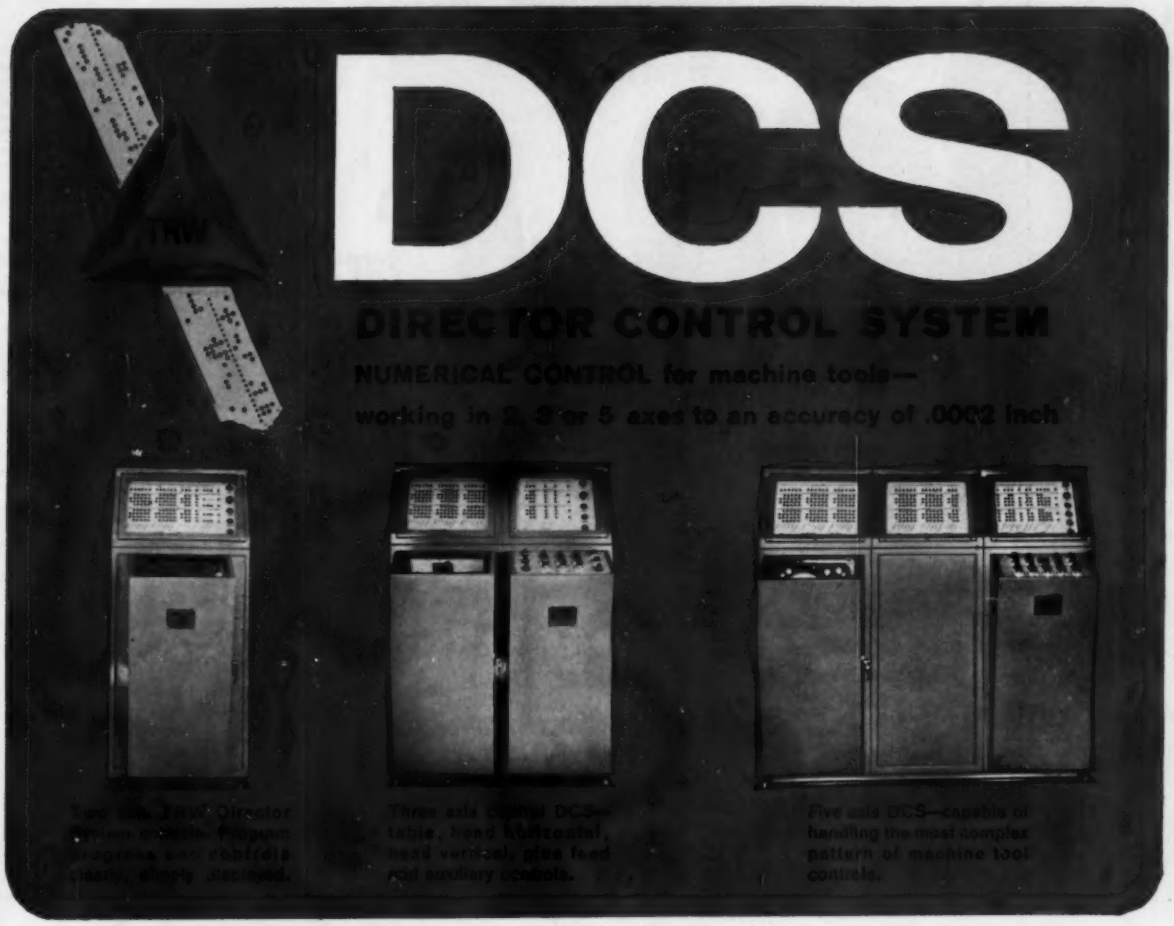
1505 RACINE STREET, RACINE, WISCONSIN

SINCE 1893

Milling, Die Sinking, Profiling and Engraving Machines with Manual Hydraulic, Electro-Hydraulic or Numerical Guidance Systems. Special Machines and Automated Transfer or Indexing Machines. Cutting Tools and accessories...Defense and special products.

SEE IT IN ACTION AT THE ASTME SHOW

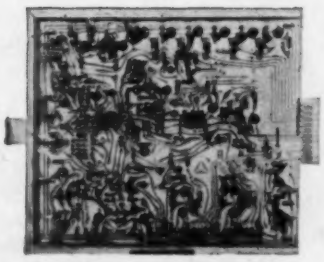
directing the GORTON RAIL-TYPE MILL in 3 axis control



Fast, accurate production can start quickly with a TRW Director Control System, because many parts to be made can have their programs punched into tape in your own shop in short order. While computers are useful on intricate jobs, a DCS can be programmed in your own shop—and we'll show you how.

This is the first solid state contour control system ever to be marketed for machine tools, and is completely proved in on-the-job performance. Simple, rugged, it will make one or a thousand parts exactly the same, even with complex curves, and auxiliary functions during the process. Mirror image, or right and left-hand parts at the touch of a switch.

Come and ask all the questions you like at booth 1536. Or, if you can't be at the show, phone or write us at Michigan City.



Designed with "Outer Space" Precision

Modular control boards created in their entirety by TRW—just as they are for outer space missiles, and to the same high precision, trouble-free service standards.

Thompson Ramo Wooldridge Inc.

Michigan City, Indiana

MEEHANITE MEANS BETTER CASTINGS®

Mixing screw for Aluminum Oxide Grain cast in type AQ Meehanite metal, replacing stainless steel. Outside diameter and shaft machined then air hardened to 44 Rockwell C. No distortion.

New AQ Meehanite®
Air Hardens....No Distortion

This new wear and abrasion resisting type of Meehanite® is a low cost metal of extremely high hardenability that offers many performance and cost advantages. It is recommended for critical castings of varying section size that require a Brinell hardness over 400 and which must retain accurate dimensions.

Such castings, made in type AQ Meehanite which has an "as cast" hardness up to 280, can be machined first, if necessary, and then safely air hardened without the risk of cracking or distortion associated with water or oil quenching. Final hardness — up to 500 Brinell; tensile strength — 66,000 psi.

AQ Meehanite® can easily be locally hardened for improved wear resistance of working faces and edges of such parts as dies, punches, cams, sheaves, etc. Another advantage is that the hardness at elevated temperatures is considerably better than most engineering materials. Also, AQ Meehanite, because of its manganese content, exhibits considerable work hardening during service.

For more information about AQ Meehanite®, send for your free copy of our 4-page folder, B-48. Write to Meehanite Metal Corporation, 714 North Avenue, New Rochelle, New York.

MEEHANITE METAL

MEEHANITE CASTINGS ARE MADE ONLY BY MEEHANITE FOUNDRIES.

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

12 PUNCH AND DIE SHARPENER—*Punch Products Corp, 370 Babcock St, Buffalo 6, NY.* 4-page catalog 1125 describes and illustrates the new Unipunch universal sharpener, a self-contained, portable, bench-type unit equipped with a built-in universal fixture.

13 GRINDING WHEELS AND SEGMENTS — *American Emery Wheel Works, Providence 1, RI.* 4-page illustrated brochure covers complete range of vertical spindle surface grinding wheels and segments. Describes various segment shapes, bonds, and abrasives available with work applications and advantages. Cylinder wheels detailed include the new Hexilinder wheel. Technical chart shows typical metals ground and specific American recommendations.

● MILLING — INSERTED BLADES OR THROW-AWAYS?—*Wesson Co, 1220 Woodward Heights Blvd, Ferndale 20, Mich.* 8-page bulletin 4-61 discusses 14 factors that influence selection, how these factors are interrelated, and the influence of each. Points out the factors that are relatively static and those that are liable to frequent change and consequent re-evaluation. Request direct on company letterhead.

14 CHEMICAL CUTTING FLUID — *Master Chemical Corp, 13 N Huron St, Toledo 1, Ohio.* 8-page brochure 460B discusses coolants and cutting fluids used in machining, grinding, drilling, and many other metal cutting operations. Miscibility and action of the all-chemical lubricant known as Trim is described. Its use is reported to make possible an increase of 10 to 50% in cutting and grinding speeds with none of the increases in other costs usually associated with higher speeds.

15 SPADE DRILLS AND HOLDERS—*Erickson Tool Co, 34350 Solon Rd, Solon, Ohio.* 6-page catalog describes and gives dimensions and prices for three standard spade-drill blades—spade-type, core-type, and the new 3-lip blade; also covers blade holders, coolant connectors, and grinding fixtures for the drills. Special blade styles are illustrated.

16 CUTTERS, REAMERS, SPECIAL TOOLS—*Special Cutter & Tool Co, 401 Salliotte St, Ecorse (Detroit) 29, Mich.* 4-page brochure presents illustrated information on wide range of high-speed

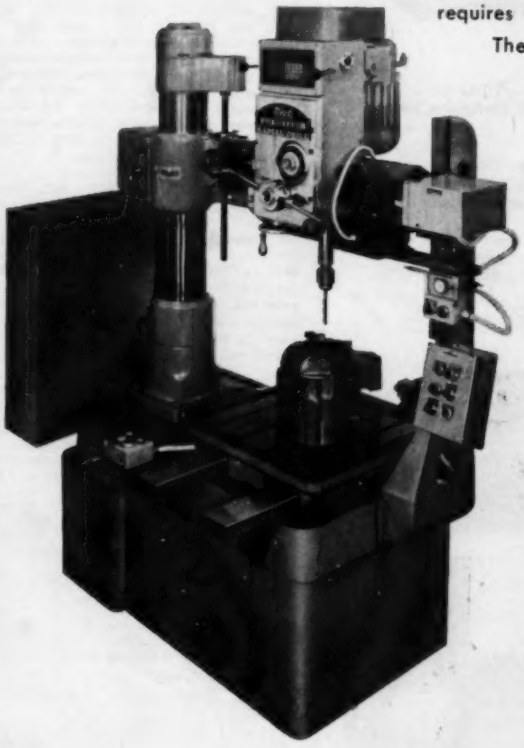
AM/MM

"Please, not today. We're having our office party."

SINGER*
NUMERICAL CONTROL

BUY THE COMPLETE PACKAGE...

FOR THE O.E.M. . . . SINGER Numerical Control . . . the most direct approach to point-to-point positioning . . . offers speed, capacity, versatility, a high degree of accuracy . . . and is available at a low initial investment. The system is sold as a package, complete and ready for installation, including the tape reader. It requires only the measuring bars to suit the specific machine. The SINGER system offers a high degree of accuracy, for drilling, jig boring or milling . . . ±.001 inches on a work table and up to 40 inches of travel.



...OR THE COMPONENTS

For the buyer who wants to acquaint himself with the advantages of automatic positioning, rather than buy a complete package, the SINGER system is ideal. Because of SINGER'S modular design, a machine can be furnished with the automatic positioning system only. At a later date, tape control can be readily added with no sacrifice of the original investment. It is important to know, too, that all modules and motors are designed, serviced and built by Diehl Manufacturing Company, a SINGER subsidiary. Call or write for an appointment at the address below.

Shown here is SINGER Numerical Control applied to the new Veetmatic Precision Drilling Machine. This electrically-operated system provides more economical operation at greater accuracies than conventional layout drilling procedures.

See SINGER Numerical Control applied to the new Veetmatic Drill at the A.S.T.M.E. Show in New York (Booth 2135), May 22-26, 1961.

Diehl† **DIEHL MANUFACTURING COMPANY**

SUBSIDIARY OF THE SINGER MANUFACTURING COMPANY
Finderne Plant, Somerville, New Jersey
Telephone: Randolph 5-2200

*A Trademark of THE SINGER MANUFACTURING COMPANY
†A Trademark of THE DIEHL MANUFACTURING COMPANY

Continuous Full Rated Capacity means BIGGER dollar for dollar VALUE!

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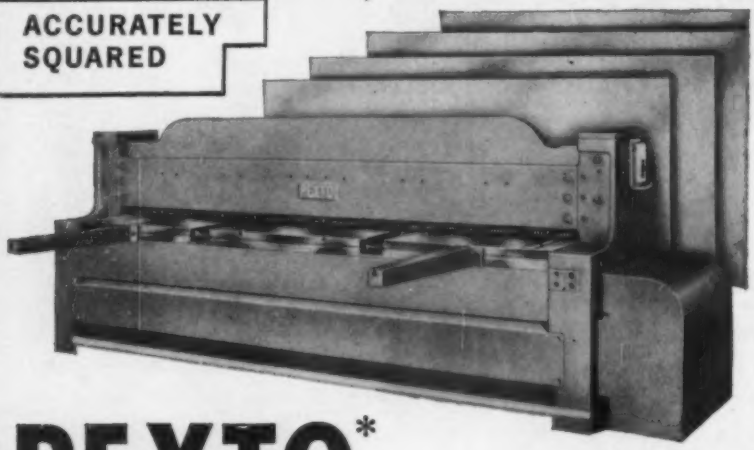

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PEXTO Power Squaring Shears have design features that provide unparalleled full capacity shearing with squaring accuracy, delivering top production all day, every day... even at full-rated capacity.
These world famous Squaring Shears are built from heavy, high-grade machine tool castings, and have self-compensating holddowns, precision gauging with maximum cutting-life from four edged blades.
These are but a few of the important features PEXTO Power Squaring Shears offer. Write for the latest literature.

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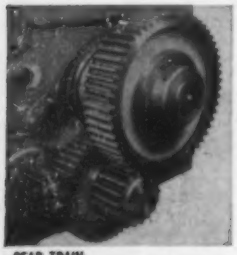

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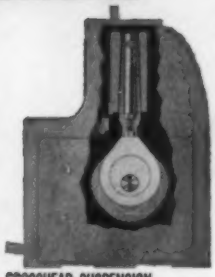

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precision cutting tools including taper, ball nose taper, multi-step, shell, expansion, line and semi-line reamers. Keyway, interlocking milling, and ball nose rose cutters are also pictured.

17 KIRKSITE AND PLASTIC TOOLS AND STAMPINGS—*Kirksite Tool & Stamping Dept, National Lead Co, 900 W 18th St, Chicago 8, Ill.* 21-page brochure discusses advantages of Kirksite (high-strength zinc base alloy) tooling; Nalcolite (high-strength, stable tooling plastic) tools for sheet metal fabrication; and finished metal stampings produced from Kirksite or Nalcolite dies.

HEAT TREATING AND WELDING

18 "WELDING AUTOMATION"—*Acro Welder Mfg Co, 1719 W St Paul Ave, Milwaukee 3, Wis.* 16-page bulletin 261 illustrates 68 special welding units with captions describing specific function of the unit. Models are grouped as Acromatic special resistance welders; Acro-Arc special arc welders; Acro standard resistance press welders; Acro-Magnetic magnetic force welders; Acro standard resistance welders.

19 WELDING POSITIONERS — *Aronson Machine Co, Arcade, NY.* 28-page article, Section 8 of the Positioneering Course by Charles N Aronson, discusses welding positioners, describes features and how they work for the user's benefit. Information on application of welding positioners for increased profits, and comprehensive specifications on 1000 to 24,000-lb capacity models are given.

20 MESH BELT FURNACES—*Harper Electric Furnace Corp, 110 Pearl St, Buffalo 2, NY.* Illustrated bulletin MB-960 describes and illustrates line of 17 Straight-Thru units for continuous brazing, annealing, and sintering operations. Included are complete specifications on all electric and gas-fired models with heating chamber lengths from 3 to 11 ft, as well as information on construction details and optional equipment.

PLANT SERVICE EQUIPMENT

21 POLISHING ROLLS—*Carborundum Co, PO Box 337, Niagara Falls, NY.* 4-page illustrated folder on Flexbac polishing rolls for lapping crankshafts and bear-

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ings tells the story of saving up to 30% on abrasive costs while maintaining the microinch finishes required for these high-speed bearing surfaces.

22 ELECTROPLATING PROCESSES—*Hanson-Van Winkle-Munning Co, Matawan, NJ.* 24-page bulletin EP-103 (new, expanded edition of EP-102) describes 19 plating and other metal finishing processes and procedures. Solution preparation, type of deposits, operating conditions, equipment required, and applications are listed for each.

23 INDUSTRIAL LIGHTING — *Better Light Better Sight Bureau, 750 Third Ave, New York 17, NY.* 16-page booklet, "Lighting for Industry," form number B-570, gives the new recommended footcandle levels; discusses quality factors in plant lighting; explains specific benefits which can result in the properly lighted plant. Ten illustrated case histories show how and where these benefits paid off. Booklet is available at 25¢ per copy from the Bureau but in many cities is available without charge from the local electric light and power company.

24 WALL CHART ON REINFORCED TAPE — *Atlantic Gummed Paper Corp, 1 Main St, Brooklyn 1, NY.* 36 x 24-in. chart illustrates the simplicity of box closing using a single strip application of reinforced sealing tape. Provides instructions concerning recommended storage and handling of reinforced tape; lists all carriers authorizing its use and the appropriate federal specification covering the product.

PARTS AND MATERIALS

25 FABRICATING TECHNIQUES FOR DUCTILE VANADIUM—*Vanadium Corp of America, 420 Lexington Ave, New York 17, NY.* Brochure discusses new fabricating techniques for hot-worked and cold-worked ductile vanadium including annealing range, extruding methods, machining and welding. Table summarizes how cold working affects strengths in various conditions. Photos show a number of fabricated materials.

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to boost production–extend tool life up to 200%

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Carmet's 700 Series is a new, premium group of carbide grades just released after exhaustive field trials. Results were conclusive. These carbides stood up under the roughest interrupted cuts going. They gave longer tool life than competitive grades in the same application class. And, they produced exceptionally fine finish cuts, even in C-8 precision boring classifications.

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CA-704 Hard and dense for the ultimate in finish cuts and precision boring.

CA-711 Ideal for medium to finish cuts in the general purpose category.

CA-720 Tough and thermal shock-resistant for medium and heavy cuts, including interrupted cuts.

These new Carmet Grades combine edge wear and crater resistance with an unmatched ability to endure shock. The 700 Series will outperform other groups of tools in any C-5 to C-8 application. Take a look at a few customer trial reports:

"Turning tapered, slotted, forged SAE 4140 valve plugs . . . formerly got 8 finished pieces per cutting edge. Now get up to 25 pieces with CA-720 on a tough, interrupted cut!"

"Turning OD of universal joint ears . . . now getting 177 pieces with CA-720 against 135 with former tool."

"On SAE 1035 rotor shafts . . . got 7 more shafts per tool with CA-711. And K Monel shafts . . . got more from 9 CA-711 tool corners than 12 corners on triangular inserts formerly used."

"On SAE 4320 forgings . . . a whopping 242 pieces with CA-720, against 209 with previous Carmet 600 Grade, 198 with best competing tool."

Remember, for less demanding operations, the 600 Series Cutting Tools will continue to be sold by Carmet. But for the really tough cut . . . when you've got to make chips on a mean, tool-buster of a job . . . this kind of performance from the 700 Series will save you time. And, cost you less than competing premium grades!

They're doing just that in shops all over the country . . . right now! Try them, just once, on your job. Your local Carmet Distributor has them in stock. Contact him for more information, or write: ***Carmet Division, Allegheny Ludlum Steel Corporation, Ferndale, Detroit 20, Michigan. Dept. AM-5-2.***

CARMET 700 SERIES CATALOG SUPPLEMENT NOW AVAILABLE

There's a new Supplement to the Carmet Catalog C-16-B, listing tool and insert styles, and prices for the new 700 Series. Contact your local distributor, or write Carmet direct.

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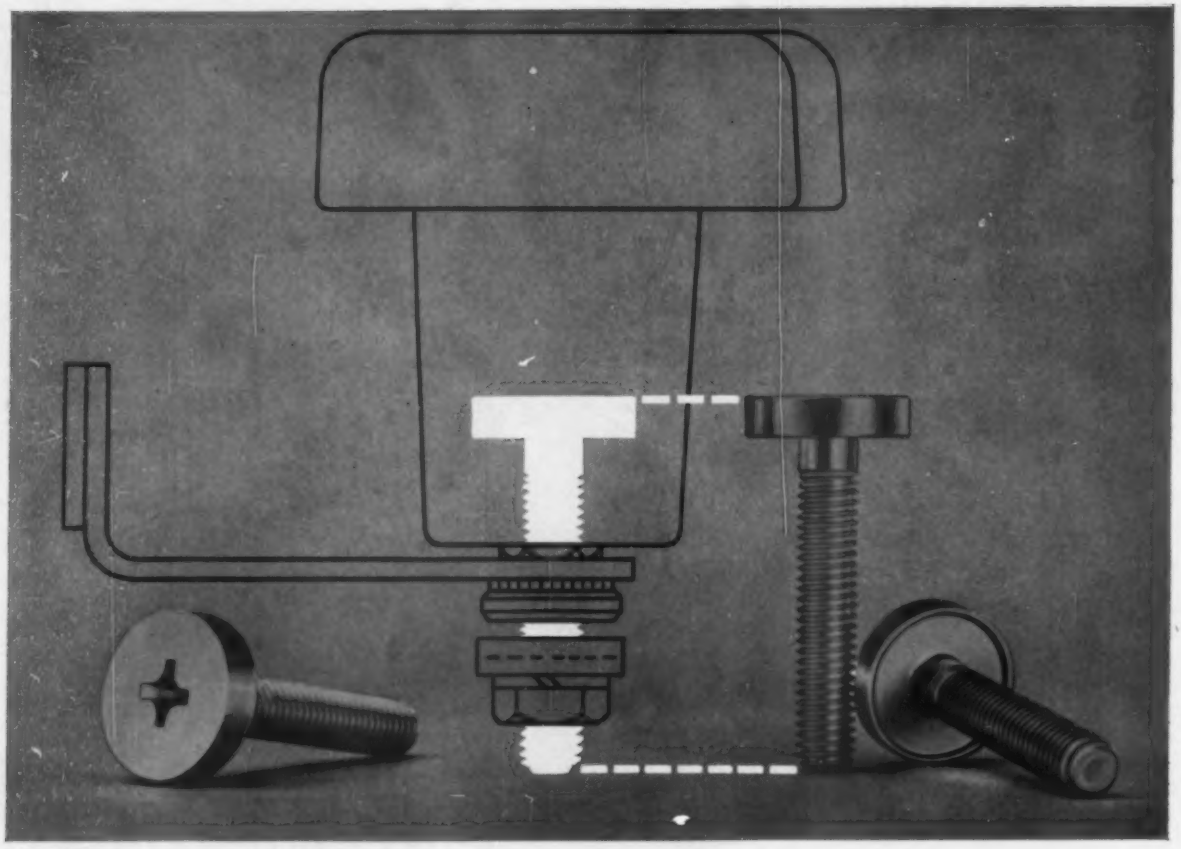

CUNISIL, new Anaconda copper-nickel-silicon alloy, gives you high strength for tough electrical jobs

THE PROBLEM: The studs for Line Materials Secondary Class Lightning Arresters (illustration above and below left) call for an unusual combination of properties. They must have high physical strength for structural reasons and to handle the stresses of high surge currents. Yet they must also have relatively high electrical conductivity. And for economical fabrication, the alloy must have good cold-forming characteristics and be readily machinable.

LINE MATERIALS Type S-3 Secondary Class Arrester with stud of Cunisil, copper-nickel-silicon alloy. Cunisil is also used for lower studs of Line Materials Protective Gaps.

THE SOLUTION: Continental Screw Company, which makes the studs for Line Material Industries, found the answer in Cunisil-837, Anaconda's versatile new high-strength, heat-treatable alloy with these valuable properties in the precipitation-hardened condition:

Tensile strength—psi min.	90,000
Yield strength—at .50% extension under load, psi min.	70,000
Elongation in 4 x D, min.	8%
Machinability, (Free Cutting Brass=100)	40
Electrical Conductivity, % IACS, as heat treated	30 to 42

In addition, Cunisil-837 has corrosion resistance comparable to copper and Everdur® copper-silicon alloys—and is easy to work cold before heat treatment.

METALLURGICAL COMMENT. Most of the nickel and silicon in heat-treated Cunisil is present as an intermetallic compound, nickel silicide, and it is the precipitation of nickel silicide in the form of particles of submicroscopic size by a relatively low temperature heat treatment that accounts largely for the distinctive properties of the alloy.

Prior to the hardening heat treatment, the alloy is brought to a proper condition for hardening with a solution anneal at a much higher temperature and then a water quench from this temperature; at this stage the alloy is quite soft and in a condition for drastic cold-working operations. The hardening heat treatment consists of heating at a controlled temperature for a definite length of time to obtain the desired mechanical properties.

For more information—see your Anaconda American Brass representative, or write: Anaconda American Brass Co., Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

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26 MOTOR COUPLINGS—*Link-Belt Co, Prudential Plaza, Chicago 1, Ill.* 6-page folder 2975 on Type MC geared flexible units brings together all pertinent data on L-B motor couplings including three new features added to the line: corrosive duty cover; spacer adapter; larger size added that now extends the application range of the couplings to a 2⅞-in. bore size.

27 THREADED INSERTS AND STUDS—*Newton Insert Co, 6500 Avalon Blvd, Los Angeles 3, Calif.* 28-page catalog D contains technical data on 20 different series of Keenserts as well as specifications on Keenserts equivalent to NAS Drawings 1394 and 1395. Advantages of the different types are itemized and complete instructions for installation and removal are included.

28 AC AND DC ELECTRIC MOTORS —*Imperial Electric Co, Akron 9, Ohio.* 28-page condensed catalog 6300 includes basic dimensions, modifications, and mounting assembly symbols for lines of drip-proof squirrel cage and totally enclosed and fan cooled units.

29 ELASTOMERIC SHEAR MOUNTS —*Lyon Aircraft Services, 2701 N Ontario St, Burbank, Calif.* 4-page bulletin gives information on these mounts that have guaranteed spring rates. Includes outline drawings, load deflection charts, load ranges, spring rates, and part numbers for the mounts which are offered in four series: two standard sizes with two configurations in each size. Mounts are designed for use with standard hardware and require no studs.

30 POLYETHYLENE GLYCOLS—*Union Carbide Chemicals Co, 270 Park Ave, New York 17, NY.* 65-page booklet describes properties and uses of Carbowax materials in liquid and solid form. Data included on solubilities; specification limits; test methods; storage and handling; toxicological properties.

31 SLING CHAINS—*Campbell Chain Co, York, Pa.* 20-page illustrated catalog S-261 covers entire line of Cam-Alloy, wrought iron, and high-test steel sling chains including new Sentry sling

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chains and Bell-type magnet assembly. Includes a glossary of chain terms and industry coding symbols.

32 INDUSTRIAL RUBBER PRODUCTS—*Cincinnati Rubber Mfg. Co, 4900 Franklin Ave, Cincinnati 13, Ohio.* 60-page catalog divided into sections on belting, hose, molded products, and rubber specialties, features extensive data sections giving detailed information on the products listed. Mechanical rubber products, particularly hose, are given the name of the service for which they are intended.

33 CHLORINATED NAPHTHALENES —*Koppers Co, Tar Products Division, Koppers Bldg, Pittsburgh 19, Pa.* 24-page bulletin T-203 covers family of Halowax products. Solubility and general compatibility with other materials are described; comparative tables of chemical and physical properties are included for each of the eight Halowax materials which have wide use as elements of flameproofing compounds and as binders for the glass, ceramic, and powder metallurgy industries. Illustrated with a series of charts depicting variations in fundamental properties.

34 TUBING — *Tubular Service Corp, Springdale, Pa.* 28-page booklet contains product information and charts as well as detailed listings of items generally available from company stocks. Included are round mechanical tubing, seamless and welded; special smooth ID cylinder tubing; square and rectangular tubing; JIC hydraulic tubing and fittings; stainless steel tubing and pipe. Gives data also on Drawn-over-Mandrel Electricweld steel tubing which is claimed to offer both functional and economic advantages over seamless tube.

35 HIGH-TORQUE SET SCREWS — *Standard Pressed Steel Co, Box 875 Jenkintown, Pa.* 8-page technical bulletin, form 2067, a review of the company's Unbrako line, analyzes the three important holding powers of a properly tightened set screw. SPS relates "tightenability" to the factors in set screw design, metallurgy, and fabrication that make for high allowable installation torques. Through highlighting Unbrako features, the bulletin serves as a guide to the anatomy of high-strength set screws in general. Illustrations include microphotographs of grain, structures, and tabulations of holding power.

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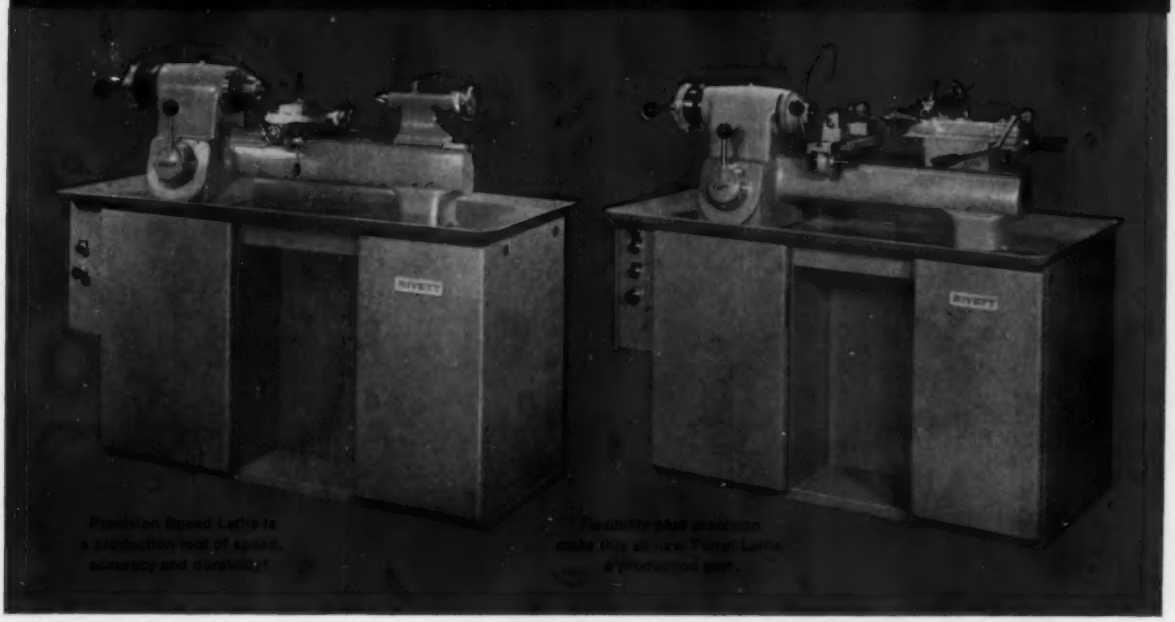

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36 VALVES—*Rockwell Manufacturing Co, Nordstrom Valve Division, 390 N Lexington Ave, Pittsburgh 8, Pa.* 20-page bulletin V-602 describes two methods for determining flow characteristics of Rockwell-Nordstrom valves. Section 1 covers the fundamental method of determining pressure drops for all types and sizes of R-N lubricated plug valves, including the Venturi type. General instructions show how to use data from the accompanying pressure drop through R-N Venturi type valves. Pressure drop values are visually picked off charts of head loss vs valve size for both gas and liquid service.

37 SPRINGS—*Associated Spring Corp, Bristol, Conn.* 16-page manual presents information needed to specify custom-designed and standardized precision springs. Summarizes basic information on helical springs, flat springs, wire forms, special fasteners, precision metal stampings, and assembled spring-like devices. Mechanical properties and recommended uses of commonly used spring materials and cold-rolled spring steels are presented in tabular form.

38 AC MOTORS—*Reliance Electric & Engineering Co, 24701 Euclid Ave, Cleveland 17, Ohio.* 12-page bulletin 2515 illustrates and describes complete line of new Duty Master units from 1 to 2000 hp. Product features of each motor are outlined and explained for proper selection of the right motor for every application.

39 HIGH TEMPERATURE LAMINATE—*Synthane Corp, Oaks, Pa.* Detailed technical data sheet provides information on Synthane Grade AA-HT, a new heat resistant laminate. An asbestos woven fabric bonded with a high temperature phenolic resin, it has the general properties of NEMA grade AA plus the ability to withstand elevated temperatures for long periods of time. It is recommended for applications requiring exposure to 1000 F or more for short periods and for applications up to 500 F for continuous service. Available in sheet, tubing, and rod forms.

40 CLAMPS AND FITTINGS—*Band-It Co, 4779 Bahlia St, Denver 16, Colo.* 24-page catalog, form B-5, on industrial pressure clamps,, hose fittings, and allied products contains illustrations, decriptions,

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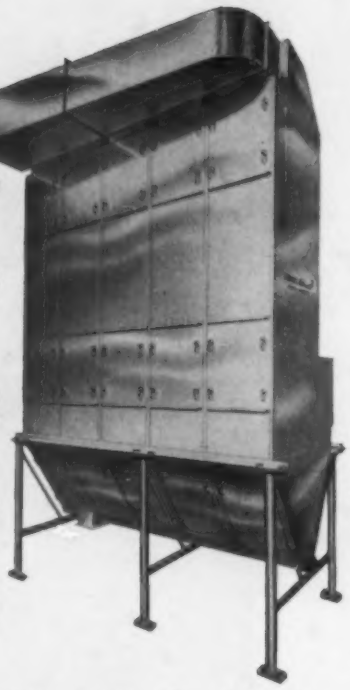

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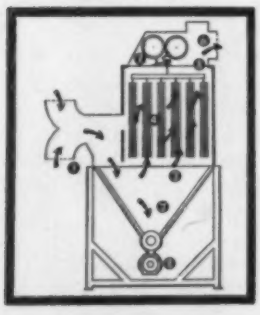

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Automatic Collector Division, 1133 Rankin St., St. Paul 16, Minn., Dept. 434

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

specifications, and list prices of all company products. Includes complete listing of all Band-It products with BS-21 (British Standard Pipe Threads) as well as NPT (American National Taper Pipe Threads).

41 CARBON-GRAPHITE MATERIALS —*National Carbon Co, 270 Park Ave, New York 17, NY.* 8-page illustrated engineering guide, bulletin S-5425, on carbon-graphite materials for mechanical applications presents grade recommendations for seals and sliding surfaces for a wide range of liquids and gases at operating temperatures up to 500 F, above 500 F, and in the cryogenic range. Detailed discussions are included on features of these materials including high elastic modulus, total impermeability, maintained flatness, resistance to chemical attack, thermal conductivity, and low friction and wear. Tabulates the 18 grades of National carbon, graphite, and carbon-graphite available for mechanical uses.

42 SELSYN INDICATING SYSTEMS —*General Electric Co, Schenectady 5, NY.* 6-page bulletin GEA-7218 gives data for remote indication and remote control; details some of the many possible applications of the G-E selsyn monitoring system. Lists several of the indicator arrangements available such as geared indicators, digital counter-type readouts, special voltage and frequency readers, and specially illuminated custom-designed recorders for wall or floor mounting. Brochure gives specification tables for customer use to select dial type, degree of accuracy desired, appropriate indicators and transmitters. Diagrams show approximate dimensions.

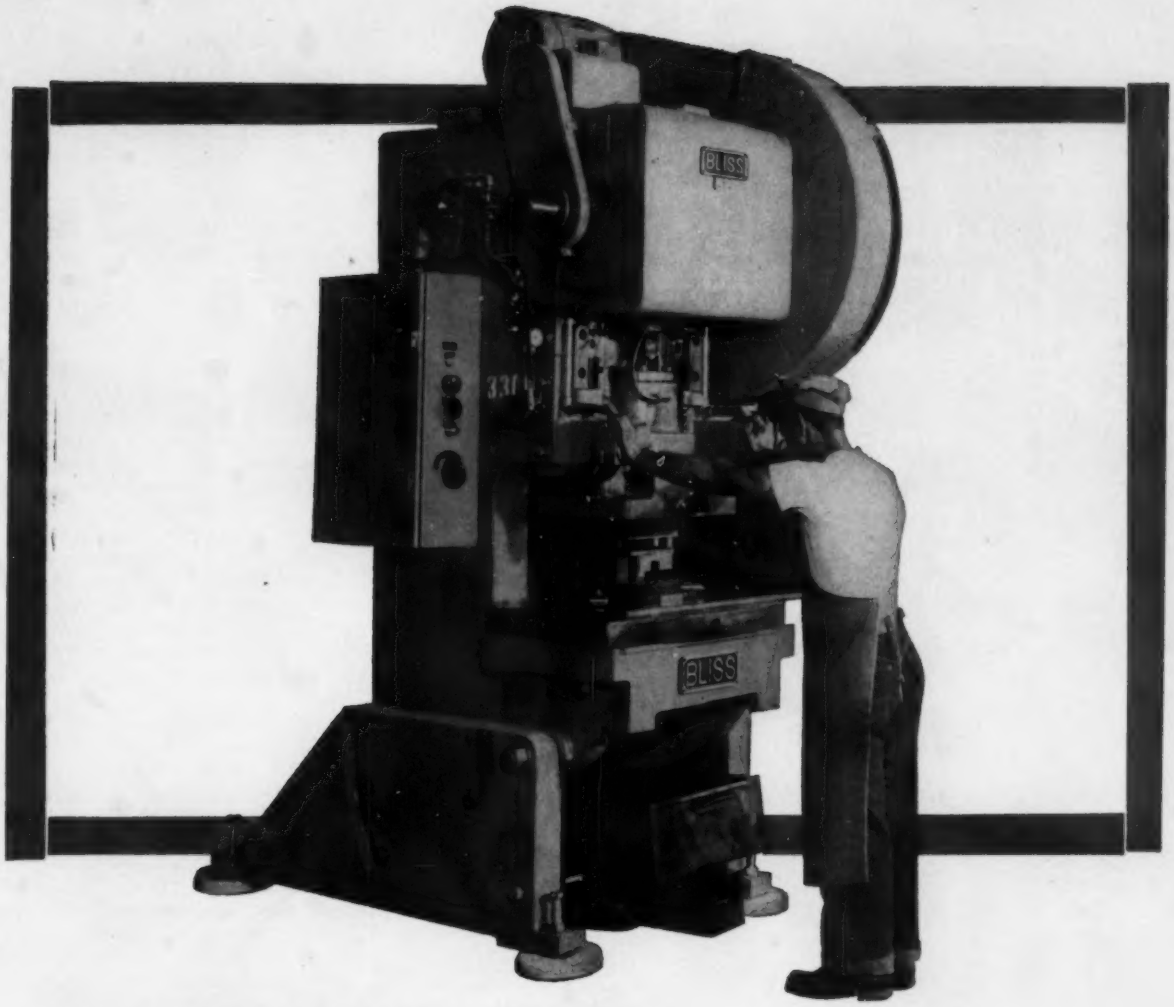
MISCELLANEOUS

43 METAL FABRICATION FACILITIES—*Eastern Tool & Stamping Co, 110 Ballard St, Saugus, Mass.* 8-page booklet describes firm's new facilities for blanking, forming, drawing, welding, and finishing of steel, aluminum, brass, and stainless.

44 "PROS AND CONS OF LEASING" —*Foundation for Management Research, 121 W Adams St, Chicago 3, Ill.* 4th edition of its study on equipment leasing, revised and expanded to 24 pages, includes new tables and charts analyzing the comparative costs of leasing; outright cash purchase; purchase by conditional sales contract; and purchase through bank financing. Charts analyzing cash flow are also included. Specific situations where it is advantageous and disadvantageous to lease equipment are discussed. New section advises executives on renewals and options-to-buy at the end of the lease period and examines the latest Internal Revenue Service rulings with regard to write-offs of payments on leased equipment.

45 PUNCH AND DIE DESIGN—*F J Stokes Corp, Punch and Die Division, 5500 Tabor Rd, Philadelphia 20, Pa.* Illustrated brochure 455 describes expanded facilities for designing and producing precision punches and dies for customers engaged in a wide variety of forming operations including the compacting of ceramics, powdered metals, nuclear materials, ferrites, anodes, electronic memory cores, glass seals; tabletting; impact-extrusion, cold heading, and other metal-forming operations.

46 AIR CONDITIONING EQUIPMENT FACILITIES — *American-Standard Industrial Division, Detroit 32, Mich.* 20-page illustrated brochure B-6429 describes facilities and products for users of air conditioning, air handling, heat transfer, and fluid drive equipment. ●



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Bliss new Big "C" inclinables are already enhancing the acknowledged Bliss reputation for reliable operation under all kinds of pressroom conditions. Big "C's" are the strongest, sturdiest made: brawny beauties that minimize deflection and can run at twice their rated speeds with ease. Consider the four new Bliss C-60's at American Seating Company, Grand Rapids, Michigan. They blank, pierce, draw, perforate, punch, trim, form, and notch in a wide variety of strenuous single-tripping operations. American Seating can't tolerate frequent downtime for repairs. It doesn't have to with the Big "C's".

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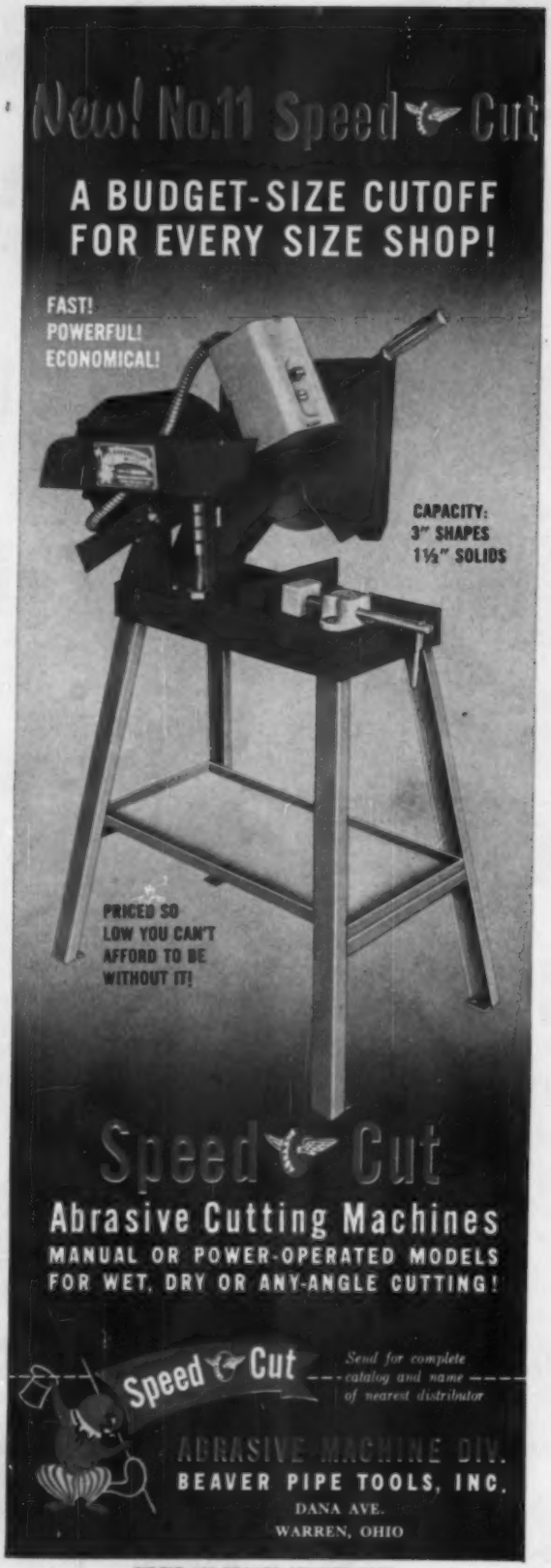


CIRCLE 462 READER SERVICE CARD

High-class Junk dealing

By George P Pearce

Some years ago I attended an auction held on the New Hampshire premises of a millwright supply company which had gone bankrupt and, while there, I witnessed a very smooth play by a junk dealer who was in the crowd. The auctioneer's deep voice carried all around the bearing assembly shop.

"The next item," he boomed, "is this powerful machinist's vise with 6-inch jaws, and it's in excellent condition. Do I hear $20?"

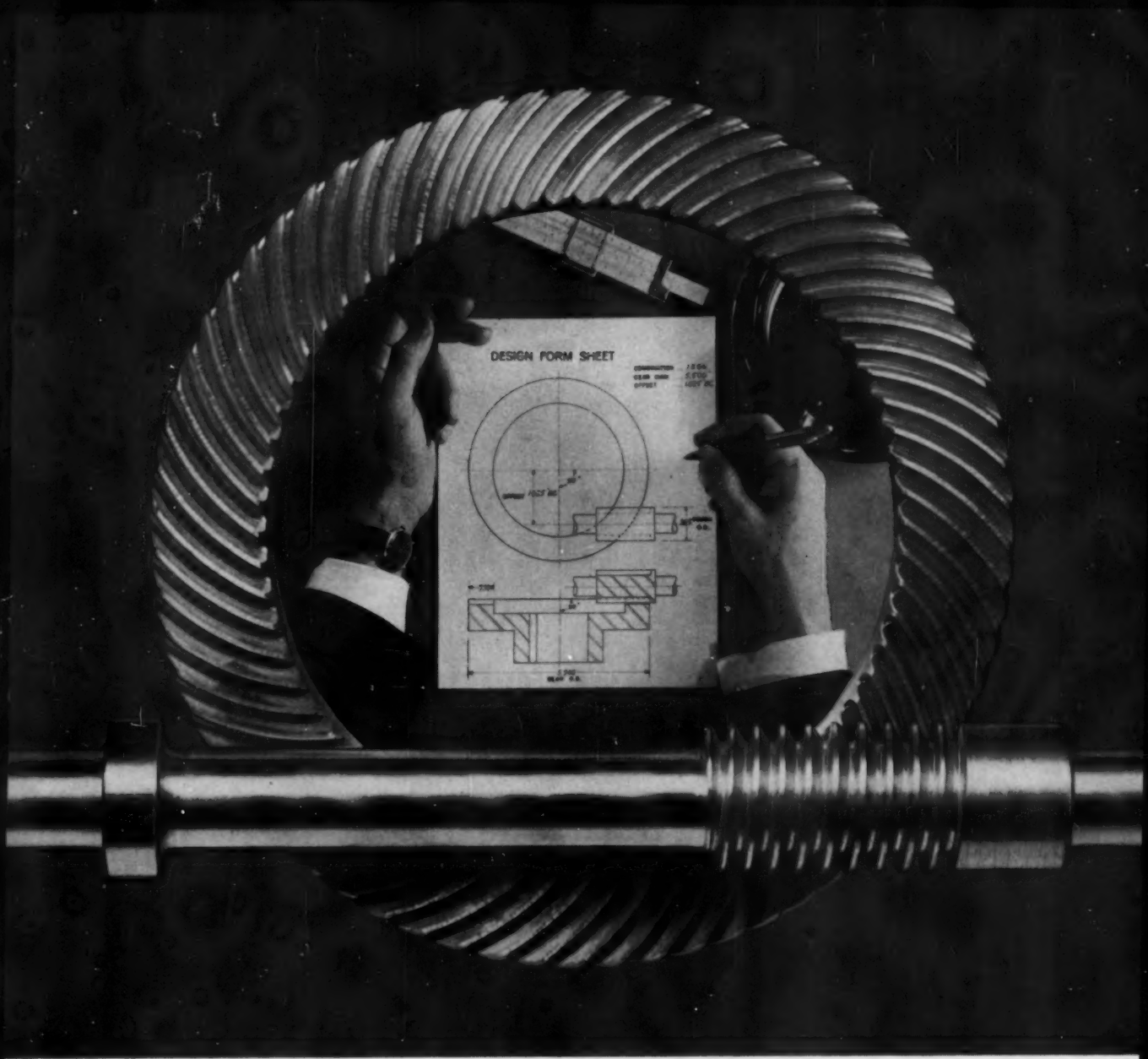
"Ye don't," said a short, elderly man with sandy hair. "I bid $8."

"Well, well . . . it's Andy Macgregor," observed the auctioneer. "I expected you to show up. The only junk around here, though, is all piled in the north yard. But this vise might be handy for you to pinch your pennies with."

The crowd of shop owners, foremen, and master mechanics laughed and even Andrew Macgregor himself managed a rather sickly smile. Someone called out "$10," and the bidding was on.

Andy puttered around for a few minutes and then, during some rapid bidding, he walked into the next shop, which the company had used when high-grade molten babbitt was poured into shaft bearing boxes. (This was before the direct drive became standard). Andrew walked across the floor with his eyes down, watching so that he wouldn't trip over any of the old molds set up on the floor. He felt unhappy. It didn't sit well to be called a pinch-penny in

"This is your idea of a running fit . . .?"



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If you want to make your transmission more quiet or more compact or more flexible, take a good long look at the HRH set shown above.

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The action is quiet and smooth and continuous because the pinion teeth *wrap around* the gear teeth. With this design you can work such quiet operation into your designs even with a one- or two-tooth pinion member.

You can add the rigid support of a straddle mounting, since bearings can be put on both ends of the pinion.

HRH gear ratios are made with proven face mill cutting techniques, assuring complete control of tooth contact pattern to compensate for any assembly or operating condition.

HRH gear ratios are designed with the *full* assistance of all Gleason engineering services. We work with you on the practical design aspects and carry through to the development of prototypes. Then we furnish both machines and tooling for full production—*without royalties.*

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Licensees of Templet are assured of uninterrupted use of this unique tooling process. T. I. P. is protected by 44 patents granted and pending throughout the world.

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CIRCLE 464 READER SERVICE CARD

front of a crowd of business men. Sam Webster, the auctioneer, had not been funny.

At this moment Andrew noticed something about the plank floor that caught his eye. He got down on his knees and began to examine the small slits left between the planks to allow for expansion. What he found was most interesting. A happy smile lit up his face and his bright blue eyes twinkled. He hurriedly got to his feet, went out to his car and drove away.

It was just six o'clock when Samuel Webster completed the sale of the company's effects. He collected his various records and was double-checking the sales items against the checks received when Andrew Macgregor drove up to the ancient office door in a large truck.

He hurried inside, grinning happily at the auctioneer and said, "Sorry I'm late getting back, Sam, but I had some business to do and it took longer than I thought. Now what are you selling next? I must buy something to remember the old babbitt firm by. They were very good to me for nigh on to 40 years."

"Well, you've mised the boat again, Andy. Everything's sold. You're just getting old and slowing down." The auctioneer spoke loud enough so that several of the men around the table, who were completing their list of purchases, turned and glanced at Andy with knowing smiles.

"Oh, no!" Andy said, sinking into a chair. "I just must buy something. Think of something, Sam. Some little thing ye missed."

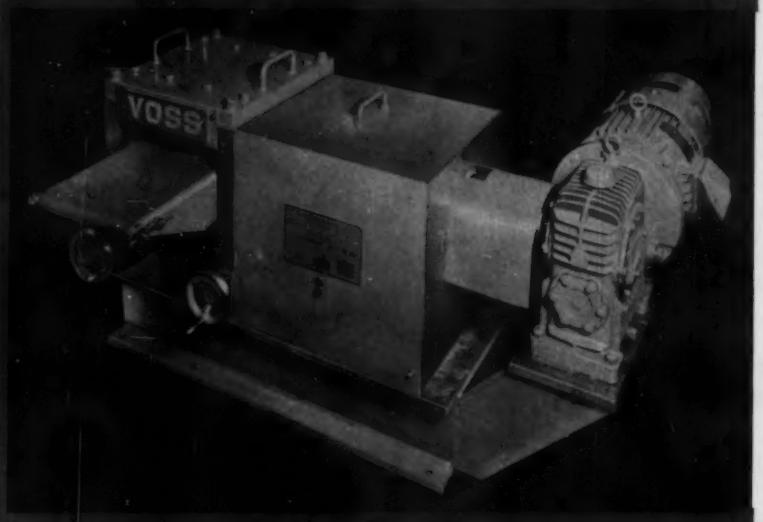
"I don't miss things, Andrew—I sell 'em," snapped the auctioneer, who was anxious to get away.

"Listen, Sam; let me put it this way," suggested Andrew. "I don't think ye're as smart as ye think ye are. I'll pay ye $8 right now if ye'll give a receipt for anything I can find lying around that ye could have sold but have missed."

The auctioneer laughed, grabbed his gavel, and said in his loud voice, "Going, going, gone. Sold to Mr Andrew Macgregor for $8 any item that I could have sold but missed." Then he turned and scribbled the receipt and handed it to Andrew in exchange for $8. Andrew hustled out of the office to his truck, which had four men in it, and drove off toward the old babbitting shop.

One of the customers grinned as he handed his check to the auctioneer for his day's purchases. "Sam," he observed, "I have a notion that that old Scotchman's up to something. I saw him sitting in that truck with four helpers. They were outside of

SPECIAL REPORT



New Parts-Flattener Ups Production Speeds 1,000% Or More . . .

Bold statement? Yes! True? Yes! In some of its present applications, two Voss flatteners and a few operators have replaced hundreds of workers assigned to hand flattening.

Principles of Voss Roller Leveler Applied—An adaptation of the Voss precision Roller Leveler, considered the Cadillac of its class, the flattener operation is based on a series of small diameter work rolls supported by multiple back-up bearings. Parts are worked to relieve stresses, achieving within .005 of dead flatness in one pass.

Reliability Built In—One of the important characteristics of the Voss Roller Leveler is its reliability and minimum downtime. The flattener shares these qualities. Rugged construction of the machine insures a long and productive life.

Hand Feed or Automatic The flattener is available either way. Most models are compact enough to sit on a desk top. The machine will handle an extremely wide variety of flat stamped parts. It can also be engineered to flatten parts having irregular surfaces.

Let Voss help you to automate your parts-flattening. Call or write today.

We'll be glad to arrange a demonstration with your parts, without obligation.

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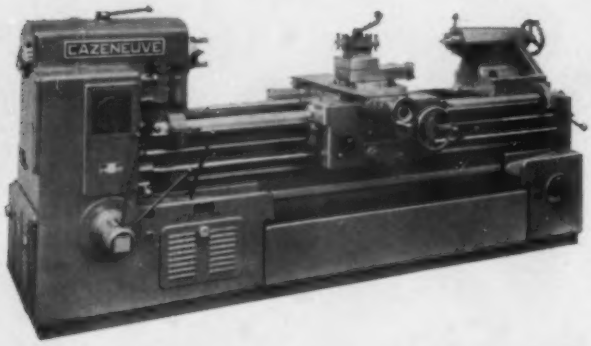

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Cazeneuve specializes exclusively in the design and construction of high quality lathes. The superior craftsmanship reflected in each Cazeneuve Lathe is known and respected the world over.

The design which has contributed to the Cazeneuve reputation, permits optimum accuracy in both tool room and production line applications. The Cazeneuve Lathe removes metal with high precision on a wide range of jobs with the speed and ease that increases efficiency to its maximum—reduces operator fatigue to a minimum.

Here are just a few outstanding features:

- TRACER ATTACHMENT repeats within .0004". TAPER ATTACHMENT also available.
- Patented 4 way tool turrets are accurate to .0005 inches.
- All shafts are mounted on anti-friction bearings.
- Ground lead and cross feed screws.
- All moving parts are automatically pressure lubricated.
- Diagonal bridging bed construction.
- Induction hardened ways and gears.

Write, phone or wire for complete specifications

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See the Cazeneuve Lathe in action at the Tool Show May 22 thru 26. Booth No. 1328

CIRCLE 466 READER SERVICE CARD

the back fence over an hour ago while your auction was on. Now he says he wants to buy and you hand him a carte blanche. Maybe he's not as dumb as you think he is."

"With *four helpers?*" yelled the astonished auctioneer. Jumping up from the table, he hustled for the old babbitting shop where he could see the truck parked near the shipping platform. He was followed by a dozen of the men who had been in the office. When they entered the shop they found, to their astonishment, that there was no sign of Andrew or his helpers. Then muffled voices somewhere beneath the floor came up through the slots between the planks. Peeping down through these they could see Andrew's men moving around with flashlights.

"Say, what devilment are they up to?" he shouted as he ran outside of the loading platform where, looking underneath, he saw a small creep-through door which led to the crawl space under the shop floor. There was Andrew Macgregor with his four helpers all busy loosening large vertical masses of babbitt metal, the accumulation of spilled molten metal which had overrun the molds during 80 years of babbitt pouring, and had solidified below.

Andrew and his helpers collected over two tons of high-grade material worth at least, 30¢ a pound, or about $1200, for a receipt marked "Paid in full" which had cost the old Scot just $8. It was easy for him to forgive Sam now for the ridicule about the vise and the pennies as he happily broke up the chunks of babbitt so they would go through the creep-through door.

Half an hour later Andrew Macgregor drove away and, as he passed the auctioneer he called out "Bye, Sam. Ye did miss a wee item and I thank ye for the odd lumps of babbitt I bought so reasonable." •

GRANT

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85 Silliman Ave., Bridgeport, Conn. U. S. A.

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AM/MM

"I warned 'em—if they hire one more nervous indecisive young guy like this I'm quitting."

A modern and effective solution

to machining problems connected with the manufacture of Heavy Engines, Turbines and Rolling Mills

New Milling & Boring Machine FBWS

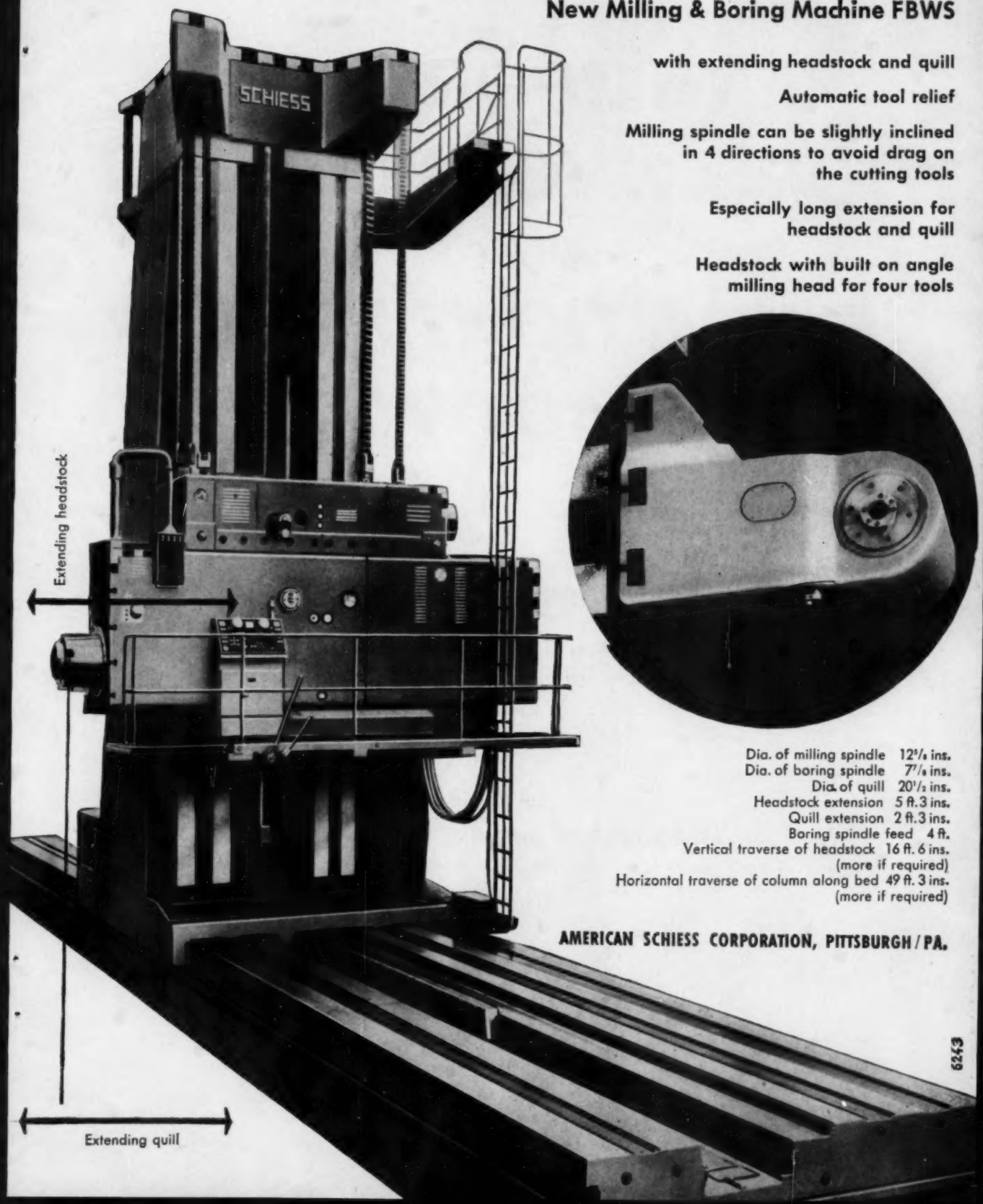
with extending headstock and quill

Automatic tool relief

Milling spindle can be slightly inclined in 4 directions to avoid drag on the cutting tools

Especially long extension for headstock and quill

Headstock with built on angle milling head for four tools



Dia. of milling spindle	12⅝ ins.
Dia. of boring spindle	7⅞ ins.
Dia. of quill	20½ ins.
Headstock extension	5 ft. 3 ins.
Quill extension	2 ft. 3 ins.
Boring spindle feed	4 ft.
Vertical traverse of headstock (more if required)	16 ft. 6 ins.
Horizontal traverse of column along bed (more if required)	49 ft. 3 ins.

AMERICAN SCHIESS CORPORATION, PITTSBURGH / PA.

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FROM A LIGHT TAP to a sledge-hammer blow, this new Thor Air Impact Wrench is *fully controllable* through an amazing range of power that defies comparison with any other wrench you can buy. Delivers work output comparable to wrenches TWICE its size!

NEW! DIFFERENT! Revolutionary OSCILLATING action controls impact blow directly, completely eliminating conventional air motor. Constant full-jaw engagement for extra power, superb control, long, low-cost service life.

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or 7/16" Hex. Ball Lock Spindle.
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Compact! Weighs only 6 lbs.

NO MOTOR!

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What's the top gross geared capacity ever developed on the old machine, in its very best days...55%?...60%?...65%?

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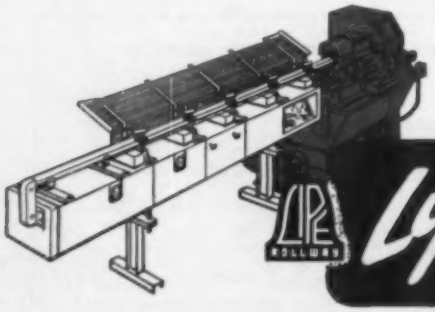
To get the most out of old OR new production machines, install LIPE A.M.L. Bar Feeds. Sold and serviced by a nation-wide network of franchised distributors in principal industrial areas.

For complete information and name of distributor nearest you, write the company.



Lipe BAR FEEDS
LIPE-ROLLWAY CORPORATION
Syracuse, N. Y.

NEW FILMS...

EASTMAN 910 ADHESIVE. *Produced by Eastman Chemical Products Inc, Subs Eastman Kodak Co, 260 Madison Ave, NY 16, NY. Also available from Armstrong Cork Co, Industrial Div, Lancaster, Pa, 16mm, sound. Running time 15 min. No charge.*

To demonstrate noteworthy industrial applications of Eastman's remarkable 910 adhesive which forms fast-setting bonds with only contact pressure and without the aid of catalysts, heat, or evaporation of solvents, this new film shows actual assembly-line procedures in four different plants. Applications involve such diversified uses as bonding metal to rubber, assembly of miniature electronic components, and metal-to-metal bonding. Detailed explanation of the characteristics of the material are given, as well as suggested procedures for optimum bonding, and practical demonstrations of what the adhesive will not do. HEL

●

LETTER TO YOUNGSTOWN. *Produced by Youngstown Sheet & Tube Co, Youngstown, Ohio. 16mm, sound, color. Running time 35 min. No charge.*

Specifically tailored to suit any one of eight different audience groups, this unusual motion picture consists of a 20-min basic section and a specialized 15-min ending. The basic section tells the story of how Youngstown makes iron and steel, from ore mines to blooming mill slab, and includes some of the most spectacular hot-metal scenes ever photographed. Also included are shots of newly developed iron mines in Canada and Labrador, a taconite plant in Minnesota, and the company's coal mine in Pennsylvania. Concluding sections cover either standard pipe; oil country goods; tin plate; bar, rod and wire; electrical conduit; line pipe; or hot and cold rolled sheet and strip. The eighth alternate ending is designed for general-public showings and covers all products in brief.

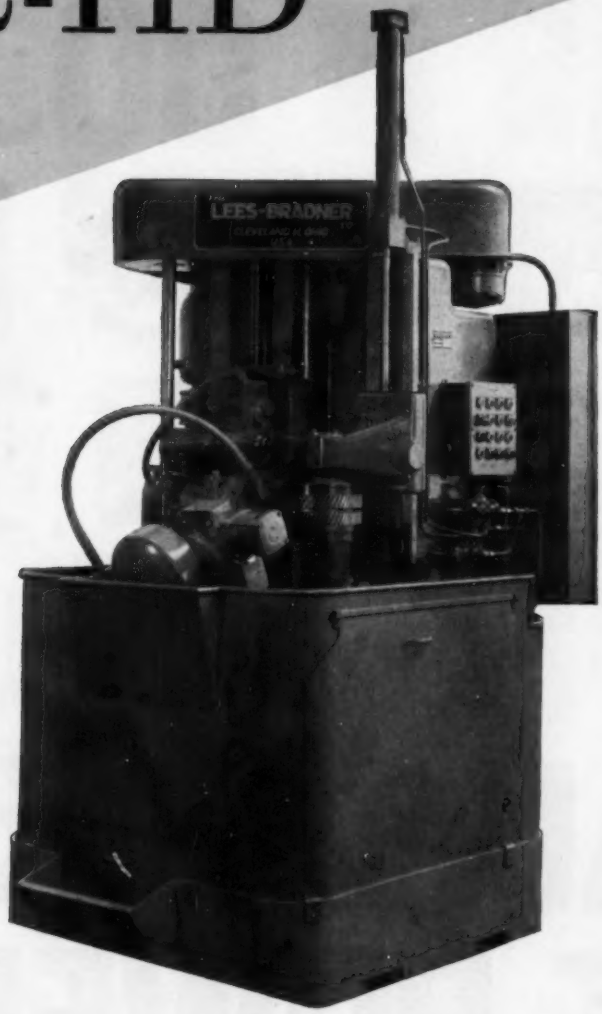
The public-relations version is available from the Youngstown general office; the specialized versions are distributed through local sales offices. HEL ●

The New

LEES-BRADNER 12-HD

Heavy Duty

GEAR HOBBING MACHINE



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IMPROVING GEARS FOR 50 YEARS

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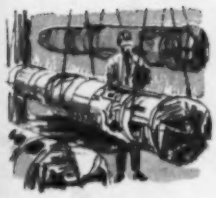


There are 21 basic manufacturing industries in the U.S. Government's Standard Industrial Classifications. Eight of them make up metalworking—the manufacturing of products from metal—and American Machinist/Metalworking Manufacturing concentrates its circulation (all ABC paid, incidentally) in these eight. An executive responsible for mining, ore-producing, or refining operations—or in any industry not involving metal*working*—is almost automatically excluded as a potential reader by his lack of vital interest in the subjects covered editorially by AM/MM.

AM/MM's circulation is centered in key metalworking plants in key metalworking states and is growing steadily in all eight divisions of metalworking.

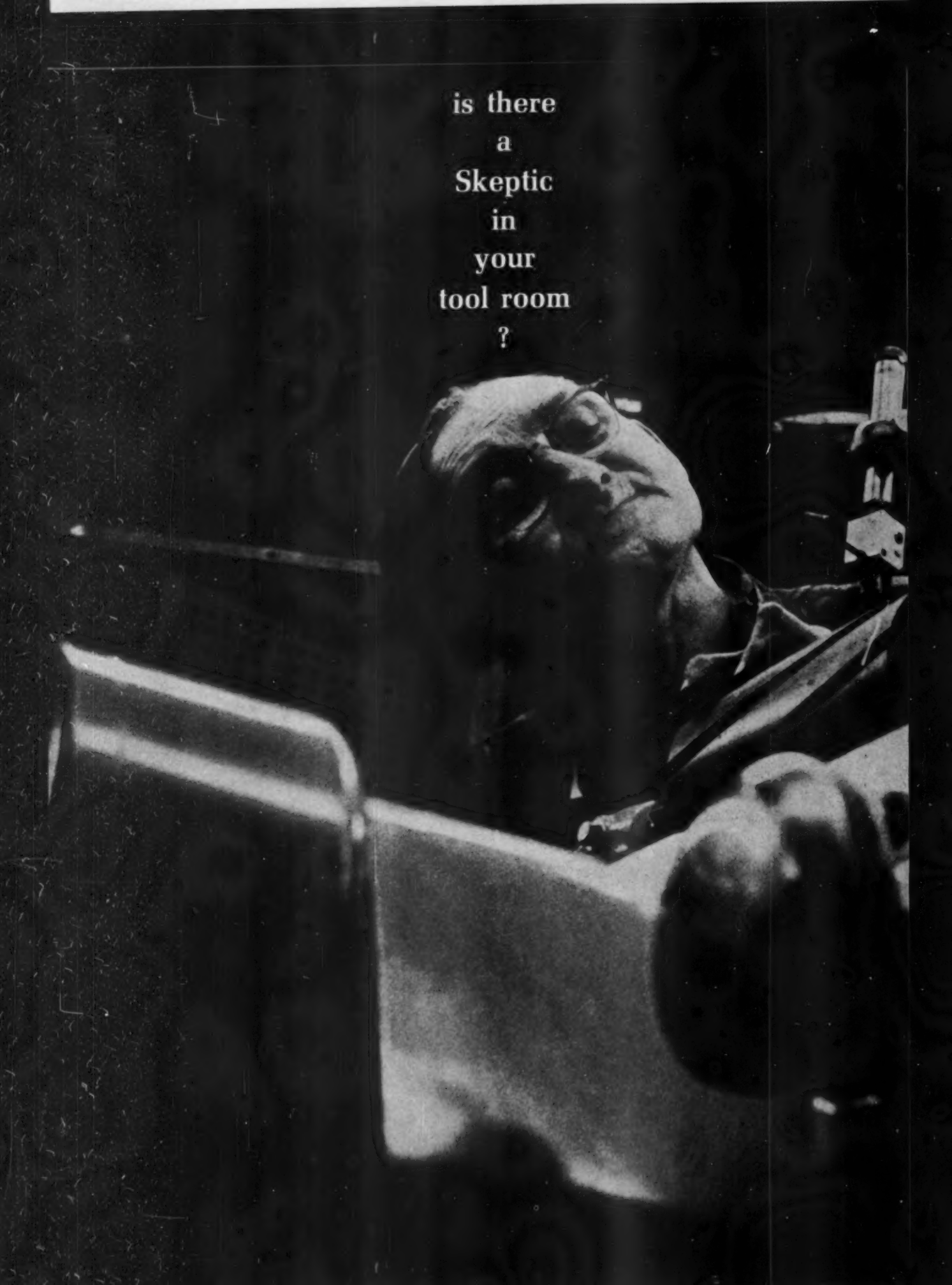
Because AM/MM is read by men—manufacturing managers, manufacturing engineers and plant managers—whose sole business is making things of metal (and making them more efficiently, less expensively, more profitably), we think you'll agree it is metalworking's most powerful selling tool.

In metalworking—men who matter read...

American Machinist / ***Metalworking Manufacturing***

A McGraw-Hill Publication, 330 West 42nd Street, New York 36, N. Y.

For up-to-date facts and figures on metalworking, ask your AM/MM *district manager for a copy of the 1960 Market Guide for Sales Executives.*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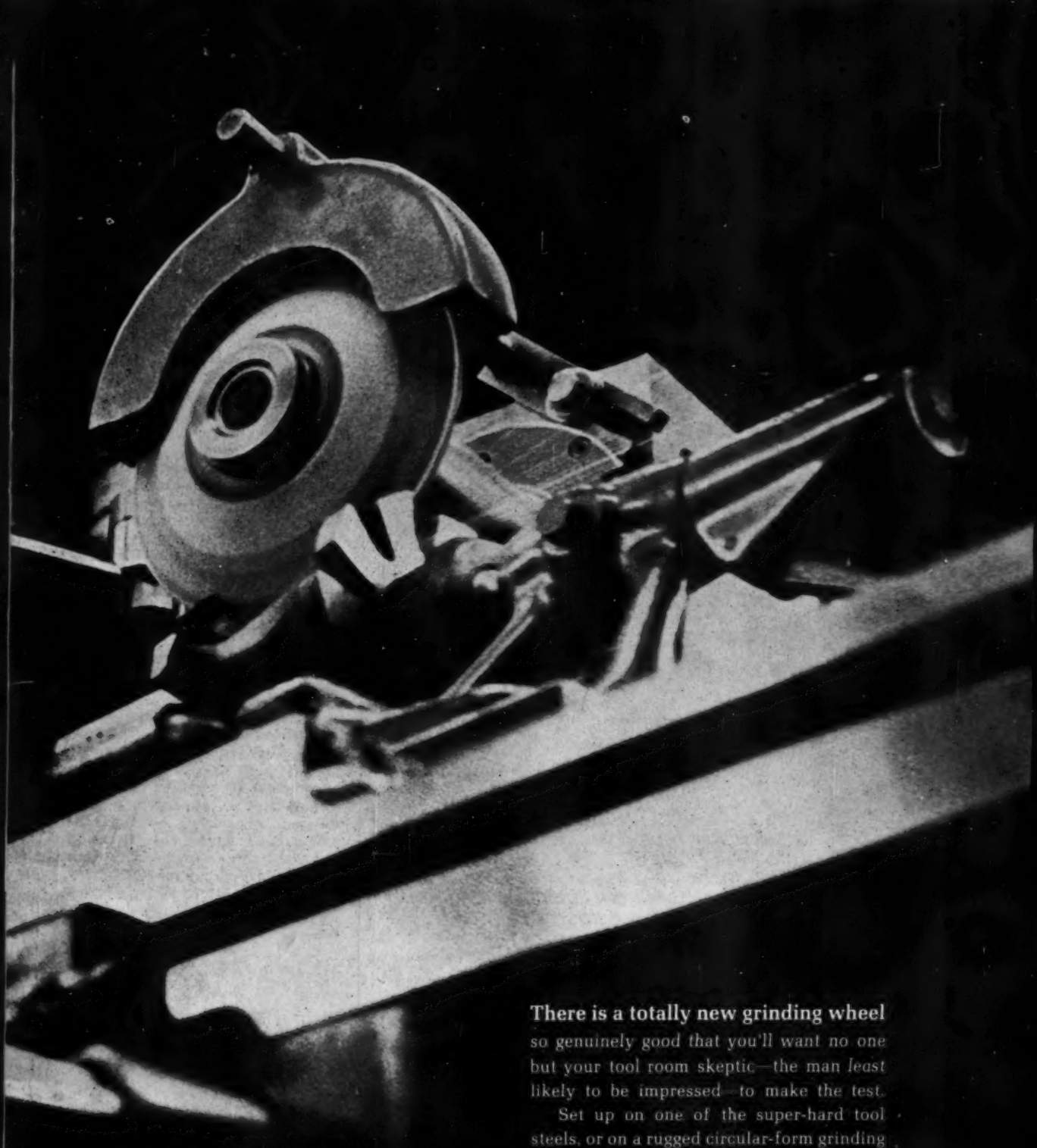
a
Skeptic
in
your
tool room
?



There is a totally new grinding wheel so genuinely good that you'll want no one but your tool room skeptic—the man *least* likely to be impressed—to make the test.

Set up on one of the super-hard tool steels, or on a rugged circular-form grinding job. Together you will experience the rare pleasure of discovering something entirely new and honestly superior: a wheel with the staying power to grind farther and faster than any other you have known.

The wheel to specify is Carborundum's PA-V40 (the initials PA stand for a totally new abrasive grain). To arrange an immediate test, simply call your Carborundum distributor or factory representative.

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Does your floor absorbent become saturated before it does its job?

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In less than 15 minutes in your own office, you can get all the right answers scientifically. Our Eagle-Picher representative will bring a miniature laboratory right to your desk. Compare Eagle-Picher Floor-Dry with any other floor absorbent. See which wins out on overall economy and full-range safety. Eagle-Picher is eager to face comparative tests. Write today.

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NEW BOOKS...

KEMPE'S ENGINEERS YEAR BOOK (1961 EDITION). *Published by Morgan Bros (Publishers) Ltd, 28 Essex St, Strand, London WC 2, England. 3000p (2 Vols) 4¾ x 6⅞. Price $12.60.*

Unlike most engineering handbooks, which are revised at about 5-year intervals, this outstanding reference work undergoes extensive revision every year to keep it abreast of the latest developments in an ever-changing technology.

In this year's edition the chapter on Road Vehicles has been entirely rewritten, provided with new illustrations, and re-titled Motor Vehicles. The chapter on forging equipment has also been rewritten and enlarged, as has the Heating section of Heating, Ventilating, and Air Conditioning. Extensive revisions have been made in the chapters on Heat & Optics, Hydraulics, and Units of Measurement. New this year is a full range of equivalents and conversion factors for metric and Imperial units.

Almost every one of the 84 chapters contains important additions planned to keep the book up to date and widen its field of usefulness in every phase of engineering, including mechanical, gas, civil, mining, railroad, and naval. Although the cost is not inconsiderable, it should be regarded as an annual investment which may well pay for itself many times over by calling its readers' attention to new and improved techniques and standards. •

AM/MM

". . . From Fred to Mary—I miss you . . . from Hank to Solly—yours always . . . from Joe the Foreman to all the boys at ACME MANUFACTURING—get to work! . . ."

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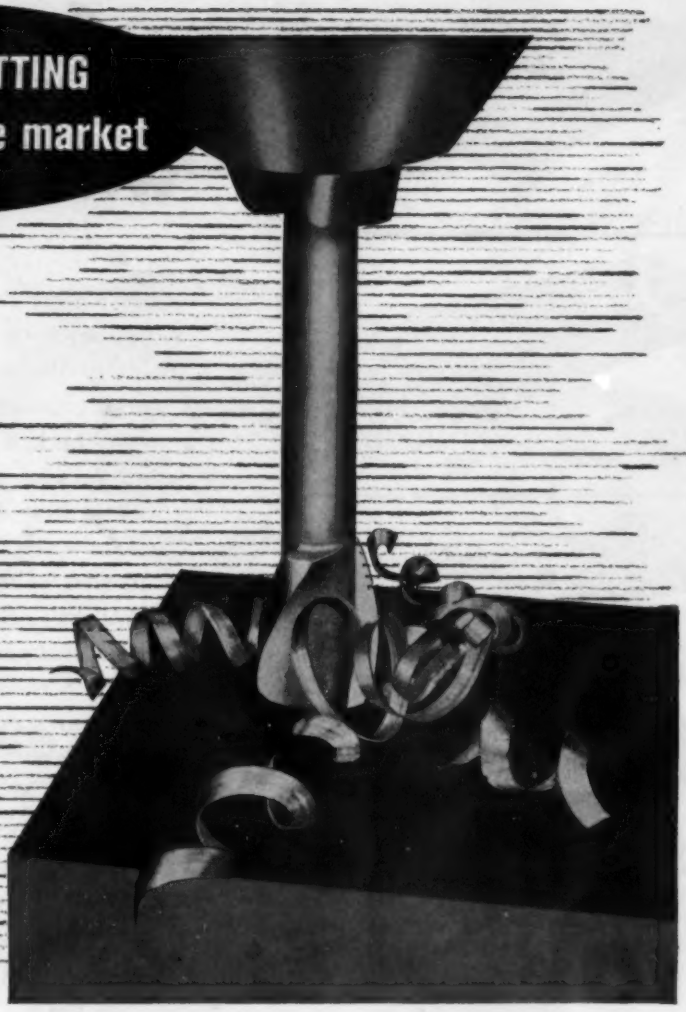
Counterbore on the market

Now–designed for new "1960 SERIES" socket head cap screw standards

OVER 40 YEARS OF LEADERSHIP SINCE 1918



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Cut production costs and stay sharp longer because:

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LONG AND TRANSVERSE BAR POLE CHUCKS

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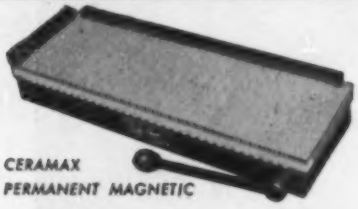
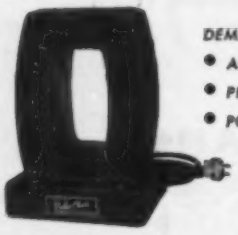


CERAMAX PERMANENT MAGNETIC

CERAMAX ROTARY CHUCKS

ROTARY ELECTRIC CHUCKS



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Stop at the Walker Booth (No. 2418) to see first hand the wide selection of magnetic chucks and other magnetic holding devices Walker has available for the metal working industry. You'll see the new Walker Electroperm Chuck, which combines permanent magnets and electric coils to permit holding large ferrous workpieces without heat distortion; the new Walker Ceramax Chucks, the new Walker Top Plate that gives wider latitude to sizes of workpieces that can be worked on Ceramax Chucks — also, the new Walker low frequency Demagnetizer that permits deeper penetration into large workpieces such as engine heads and die blocks. These, as well as many standard Walker Chucks and demagnetizers will be on display. Even if your requirements don't fall within Walker's standard product applications, a Walker representative or engineer will be on hand to explain how Walker has solved hundreds of special magnetic holding problems and can help you, too. In fact . . . it's a good bet that at Walker's booth you'll find the perfect answer to any magnetic holding problem you have.

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New COLD OPERATING ELECTROPERM CHUCK

For the first time, a cold operating magnetic chuck is available in all larger standard sizes up to 42" x 96".
Because the new Electroperm Chuck operates cold, precise dimensional stability is maintained. The chuck will hold the precision of the machine tool. The chuck is only energized and de-energized electrically, but the permanent magnets provide the holding power. Heat is eliminated.

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Features intermediary magnetic poles to make gap divisions finer. ⅛" poles added permits secure holding of thin work pieces as small as ⅛" in diameter. Retention of ¼" poles provide maximum holding for larger pieces.

SEE ALSO AT WALKER'S BOOTH THESE FAMOUS BUX PRODUCTS:

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Permanent Lifting Magnets

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now... a finer, faster finishing touch created by three-dimensional vibration

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for Speed Measurement and Motion Analysis of these and many other Mechanical Actions

- Peak light intensity is as high as 4 million beam candlepower.
- 1-to 3-microsecond flash duration freezes motion, lets you see details you've never seen before.
- Measures speeds to 25,000 rpm directly; useful to 250,000 rpm.
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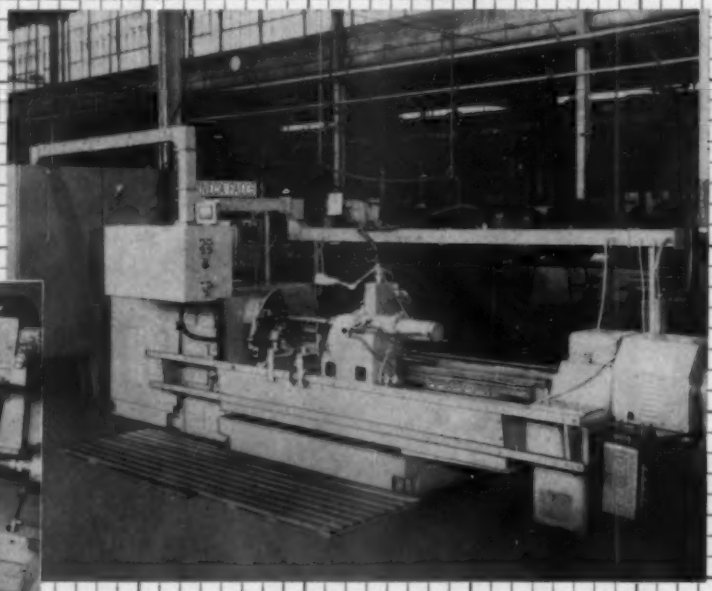
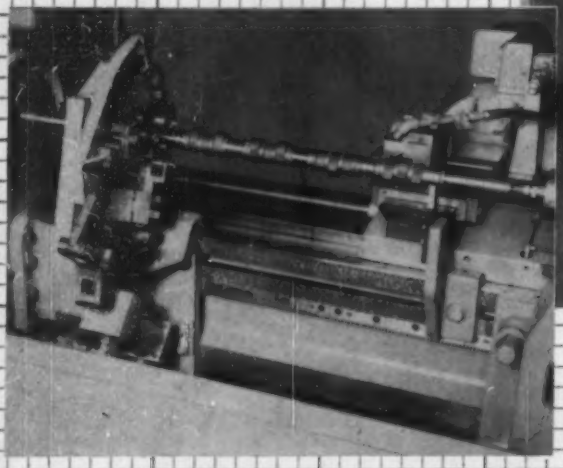
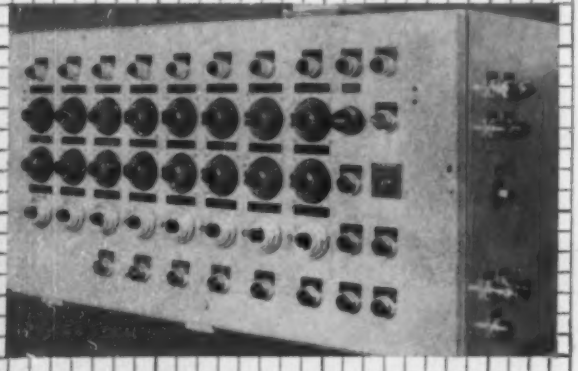


ONLY 3 TO 4 MINUTES
required to program for machining of any one of thirty-five different diesel engine camshafts.



MACHINING CONSISTS OF a qualifying cut on five intermediate and two outboard bearing diameters. This enables the parts to be completed in one simple operation and eliminates a green grind.



THE OPERATOR MERELY SETS INPUT DIALS for diameters as well as *start-cut* and *end-cut* positions of each bearing. No template is required.

This job application thoroughly demonstrates the versatility and production efficiency of the Seneca Falls Model LQ Automatic Tracer Lathe coupled with the Seneca Falls Simplified Numerical Control System.

The machine is equipped with a 90° turning carriage for Y axis feeding of the cutting tool into unique *diameter* positions. *Start-cut* and *end-cut* positions on the X axis are determined by point-to-point rectilinear controls with the reference being the face of the spindle nose.

The complete, multi-pass machining cycle is programmed for automatic operation on any given job by simply setting the calibrated dials on the control panel. A series of eight rows of dials is seen on the illustration at lower left. A row of three dials controls the geometry of each bearing. The top dials control the *start-cut* positions; the center dials, the *end-cut* positions; and the bottom dials, the unique *diameter* requirement for each individual bearing. Dial settings for each job are determined by the Methods and Processing Department so that operator changeover time is but three to four minutes.

Production at 100% efficiency on the six cylinder camshaft illustrated is twenty-three pieces per hour. Accuracy of plus or minus .001" is maintained on all seven bearing diameters.

Let us put this same production engineering know-how to work for you. Tell us about your turning and automation problems. Short run, frequent changeover... heavy stock removal... accuracy and finish... costly handling? We have solutions.

Write for Bulletin Q-59

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

BATH *Tap'n Gage* TIMES

A series of technical discussions that will be helpful in getting better results from tapping and gaging operations

Vol. 1 No. 12

Subject: Acme Screw Threads

Acme screw threads were formulated prior to 1895 and were intended to replace square threads and a variety of threads of other forms used chiefly for the purpose of producing traversing motions on machines, tools and in similar applications. They are now used for many parts in valves, jacks and other mechanisms. The basic characteristic of an acme thread is the 29 degree included thread angle.

General Purpose Acme Thread Classes:
There are three classes of general purpose threads. They are known as 2G, 3G and 4G. Class 2G is the preferable choice for general assemblies. Classes 3G and 4G are provided for cases where less backlash or end play is desired. External threads of any class may be assembled with internal threads of any other class to provide different degrees of backlash or end play.

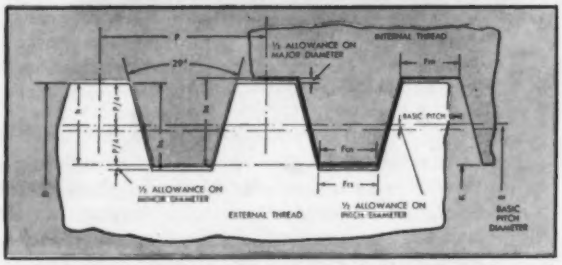
Centralizing Acme Thread Classes:
There are five classes of centralizing threads. They are known as 2C, 3C, 4C, 5C and 6C. Class 2C provides the maximum backlash or end play. Classes 3C, 4C, 5C and 6C are provided for cases where less backlash or end play is desired. While external and internal threads of the same class are recommended for centralizing assemblies, different amounts of backlash and end play may require interchanging the classes.

Uses of General Purpose and Centralizing Acmes:
General purpose threads have clearances on all diameters for free movement and may be used in assemblies with the nut rigidly fixed and movement of the screw in a direction perpendicular to the axis limited by the screw bearing or bearings. Centralizing threads have a limited clearance at major diameter of screw and nut so that bearing at major diameter maintains approximate alignment of the thread axis and prevents wedging on the flanks of the thread. In any case sufficient end play must be left to provide a close running fit. Multiple threads should be considered when fast relative motion is required.

Ordering Acme Taps:
The problems involved in tapping acme threads vary greatly and because of this it is very important to supply the tap manufacturer with complete information about the job. In many cases it is necessary to design sets of taps with the style and number dependent on the diameter and pitch, number of pieces to be tapped, surface finish of thread required, material to be tapped, length of thread and other considerations.
When ordering be sure to give: 1. Nominal size and threads per inch. 2. Single, double, triple or quadruple thread. 3. Lead. 4. Right or left hand. 5. Pitch diameter or class of thread. 6. Description of previous taps. 7. Material. 8. Length of nut, opened or closed — and clearance. 9. Diameter of hole before tapping. 10. Type of machine to be used. 11. Are taps to be used for sizing of rough chased threads. 12. Furnish part drawing or sketch. (Upon request, a special form will be provided by Bath for ordering).

Approx. length of tap — 36"

A typical set of Bath Acme Taps with threaded pilot.



Gaging Acme Threads:
General purpose threads may be adequately gaged by the use of "go" and "not go" plug and ring thread gages representing the product limits. Design should be in accordance with the principle that the "go" gage should check simultaneously as many elements as possible and the "not go" gage can effectively check but one element. Centralizing threads are gaged in the same manner and following the same principles as with general purpose threads except that two "not go" plug gages are required because of the close tolerance major diameter. One gage checks pitch diameter — the other major diameter.

Reference: U.S. Dept. of Commerce Handbook H28, A.S.A. Pamphlet B 1.9

●Cylindrical and Thread Gages● Ground Thread Taps● Internal Micrometers John BATH & Co., Inc.
22 Mann Street, Worcester, Mass.

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DUMORE AUTOMATIC DRILLING UNITS

do all these jobs, and more . . .
TAP • DRILL • REAM • CHAMFER
SPOT-FACE • CENTER • DE-BURR
even in stainless steel

COMPLETELY AUTOMATIC . . . just plug in and they're ready to go . . . all controls built in. Unskilled labor can learn to operate in minutes. Actuation by foot switch leaves both hands free for parts loading, positioning, unloading.

Once set, they're always set with no operator fatigue, slowdowns, or errors—minimizing scrap loss and tool breakage—resulting in lower cost, increased production. Easy, quick control adjustments for fast change-overs from job to job, long or short runs. Capacity from #60 to ⅜" for drilling, or #0-80 to ½"-20 tapping in steel. Automatic woodpeckering control available for chip removal in deep holes. Multiple spindle heads fit on nose of basic unit for simultaneous multi-hole work.

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on your own drill press column, or our's . . . and see the wonderful proof of performance.

ASK YOUR LOCAL DUMORE INDUSTRIAL SUPPLY DISTRIBUTOR
for a demonstration, now . . . in your own shop if you like. 3 models to choose from, priced from $595.00, FOB Racine, complete with all components including motor, ready to operate. Factory trained field service and application advice, of course. Complete line of accessories, too!

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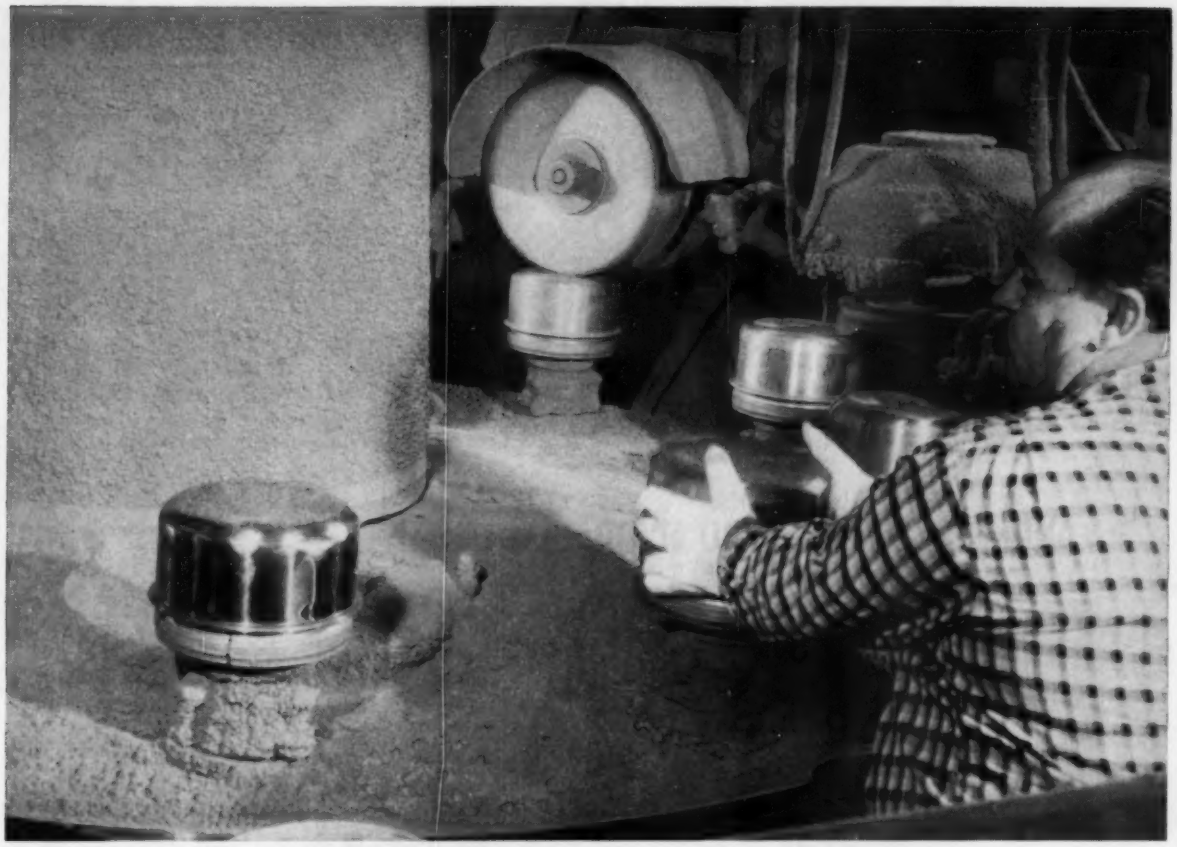

3M Abrasives Cut Costs of Steel Utensil Finishing

Nationally famous, "Ekcoware" cooking utensils are manufactured here in the housewares division of Ekco Products, Inc., Massillon, Ohio. Prior to color buffing, these copper-clad stainless steel pans are given a final polishing.

Abrasives Ekco formerly used for this final finishing required a considerable amount of "break-in" time and caused many pan rejects.

Now, thanks to a 3M Representative's suggestion, Ekco has switched to 3M "PG" Wheels. The results have been remarkable. "PG" wheels have upped production 20%, eliminated one handling operation, reduced rejects, and produced a better finish on the pans. There's no "break-in" period either, as 3M "PG" Wheels maintain an even cut from installation to throw-away point.

Why not let 3M's new COST CHECK 5-4-5 Program help you to effectively investigate ways to lower costs and increase production. Discover:

- If your grinding can be done more economically
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- If your polishing can be done faster and better

Send today for a free COST CHECK 5-4-5 Review Form without obligation. Put 3M's years of abrasive know-how at your disposal.

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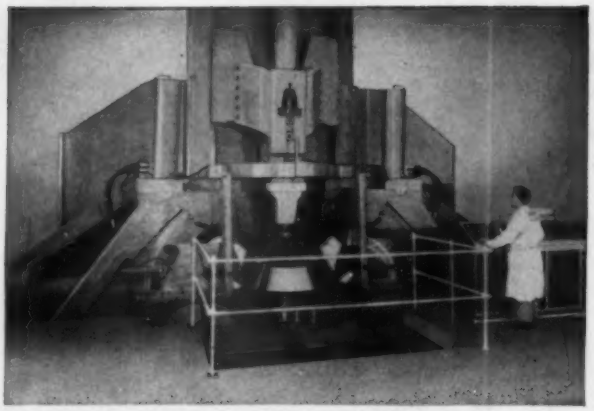
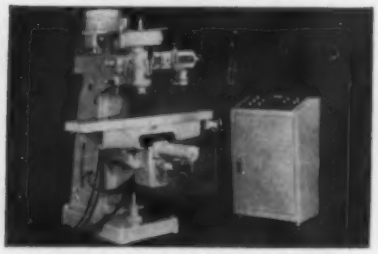


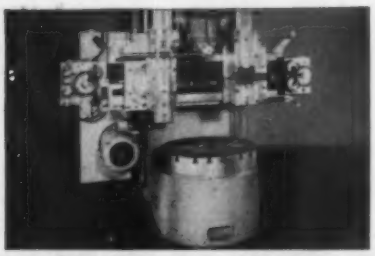
Hufford Corporation spin forge machine with *two* Honeywell 360° Tracer Control Systems plus spindle speed control.

HONEYWELL ELECTRO HYDRAULIC TRACER SYSTEMS



Gorton Vertical Milling Machine equipped with Honeywell 360° Electro Hydraulic Tracer Control System.

Frauenthal vertical contour (radome) grinder with Honeywell Electro Hydraulic Tracer Control System.



Giddings & Lewis Vertical Mill with two Honeywell 360° Electro-Hydraulic Tracer Control Systems.

Now operating on a wide variety of well-known machine tools (some of them illustrated at the left), Honeywell 180° and 360° Tracer Control systems provide fast, accurate and reliable system response for smooth application of large increments of hydraulic power.

They combine the flexibility, remote control and finesse of electronics with the power and fast actuation of hydraulics. They're far more flexible than completely hydraulic systems. These systems have been designed for ease of application. Modular construction simplifies and speeds field service.

ACCURACY—Accuracies of + .0005″ from template to part and + .0002″ from part to part have been achieved in actual use.

ADAPTABILITY—These systems are now in operation on all types of machine tools, from light duty engine lathes to huge spin forging machines. Every application is custom fitted—at production line prices.

PERFORMANCE—Each Honeywell system becomes an integral part of the machine tool. The control system can be adjusted to compensate for changes in machine performance during the life of the machine. Speed range of 300 to 1 is normal; greater rangeability is available on some applications. Tracing speed ranges up to 60″ per minute are available.

For further information on Honeywell's new machine control systems and components and their application to your specific job, contact Minneapolis-Honeywell, Machine Control Group, Dept. AM-5-61. Minneapolis 8, Minnesota. *Sales and service offices in all principal cities of the world.*

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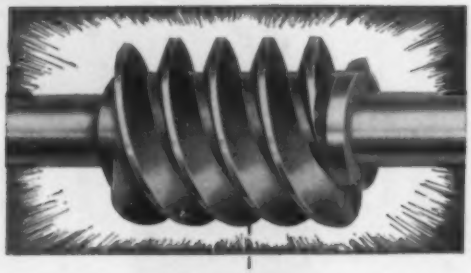
H First in Control

For the deepest draws on the toughest metals

Johnson's 700 WAX-DRAW does every draw in the shop. *Easy to apply* by roller coating, spraying, dipping, etc. Use wet or dry. Blanks can be fed directly into the press or may be pre-coated, dried and palletized. *Easy to remove*, using solvent bath, vapor degreaser, alkaline washer or even hot water alone. *Money saving.* One gallon undiluted covers 2,000 square feet. Four-to-one dilutions produce excellent results. 700 Wax Draw handles multiple draws with only one application even at pressures to 200,000 p.s.i. and temperatures to 450°F.

For further information write: **JOHNSON'S WAX** Racine, Wisconsin, Dept. AM-5.



Cleveland's Master worm principle enables exact mating of any replacement worm or gear...

if ever required!

These original Master Worms —our "common denominator" of quality—as well as all hobs for each size and ratio of Cleveland worm gearing are individually produced in our tool room to extremely close tolerances. Furthermore, each hob is painstakingly checked against the master worm—as are all Cleveland production worms and gears.

It's never necessary to replace Cleveland worms and gears in *sets* Because, each Cleveland production worm or gear is a duplicate of each other.

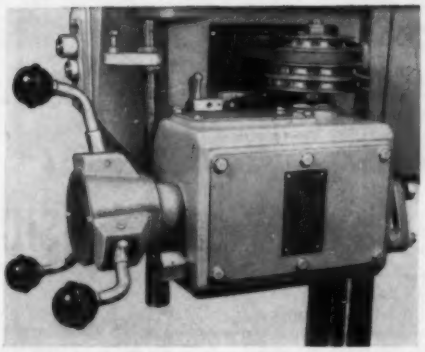
A new gear will always mate exactly with an old worm and vice versa. Cleveland's Master Worms are never destroyed but kept in perpetual stock—always available at a moment's notice So, you're guaranteed perfectly fitting worms or gears for service and maintenance requirements.

Get the complete story from your Cleveland Representative, today. Or, write us direct for free Bulletin No. 405—it gives full engineering information.

Cleveland Worm & Gear Division
Eaton Manufacturing Company
3254 East 80th Street • Cleveland 4, Ohio

CLEVELAND
Worm Gear
Speed Reducers

You can do more with these ALL NEW DELTA 17″ drill presses



Equipped with exclusive new Rockwell Power Feed, these presses can operate in remote control or be interlocked with automation devices. Available as original equipment or as an accessory on every model.

FREE BROCHURE—Complete specifications on the new Delta 17" drill presses and accessories. Write: Rockwell Manufacturing Co., Delta Power Tool Division, 618E N. Lexington Ave., Pittsburgh 8, Pa.

Here's a major engineering advance from Delta to give you increased drilling accuracy, more job flexibility and greater operating economy. You can choose from 76 models that incorporate these up-to-date performance features: New Internal Depth Stop Mechanism, Quick-set Depth Gage, Interference-free Guard and Pivot-type Motor Mount.

These drill presses are completely new—not merely improved or restyled—but actually redesigned to deliver consistent precision operation under the most rugged work loads with little or no maintenance.

Your Delta Industrial Distributor (listed under "TOOLS" or "MACHINERY" in the Yellow Pages) will gladly demonstrate how these 17's can save you dollars, hours and material. Why not call or see him soon!

DELTA INDUSTRIAL TOOLS

another fine product by

ROCKWELL

CIRCLE 490 READER SERVICE CARD

MOORE ANNOUNCES UNPRECEDENTED 10-YEAR GUARANTEE OF MILLIONTHS' ACCURACY

Published Tolerances	
Longitudinal Travel:	
Greatest error in any inch	30 millionths
Greatest error in 18 inches	90 millionths
Cross Travel:	
Greatest error in any inch	30 millionths
Greatest error in 11 inches	90 millionths
Squareness:	
Compound slide	60 millionths
Full travel, spindle housing	90 millionths
Full travel, spindle	90 millionths

No. 3 Moore Jig Borer

No. 3 Moore Jig Grinder

10-year Deviation Guarantee	
Lead Screws	50 millionths
Quill fit, or clearance (Jig Borer)	20 millionths
Vertical slide fit, or clearance (Jig Grinder)	50 millionths
Compound slide squareness	20 millionths
Base ways	30 millionths
Table ways	30 millionths
Squareness of spindle to plane of travel	50 millionths

Moore can now, with confidence, guarantee the *accuracy-plus-durability* of hardened, ground and lapped lead screws and ways, plus the other locating features of its No. 3 Jig Borers and No. 3 Jig Grinders. Here's why:

The first No. 3 Moore Jig Borer built has now been operating in our toolroom for 5 years, an average of 2,300 hours per year. We have also inspected several other No. 3 machines in customers' plants. Our experience with hardened, ground and lapped lead screws now goes back 30 years. All of this history has provided us with sufficient data to project the performance of our No. 3 machines over a 10-year period.

As a result, we will now *guarantee* that the basic locating features of the standard No. 3 Moore Jig Borer and No. 3 Moore Jig Grinder will not wear or deviate in normal use *beyond published tolerances* over a 10-year period more than the specified amounts shown above.

This guarantee is retroactive to include the No. 3 Moore Jig Borers and Jig Grinders already built and in use. It applies to original owners only, and is in addition to our unqualified 1-year guarantee.

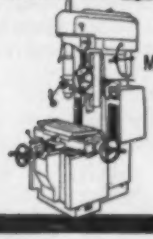
You can call in our service man to check your machine at any time, at our regular charge. If this check reveals wear in excess of that specified above, we will correct the machine promptly at our expense.

Dick Moore

Richard F. Moore, President
Moore Special Tool Co., Inc.,
738 Union Avenue,
Bridgeport 7, Conn.
April 1, 1961

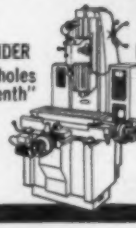
While in New York call Forest 6-3226 (Bridgeport) for visit to our plant

ONLY MOORE TOOLS CAN OFFER THIS COMPLETE PACKAGE OF PRECISION



MOORE No. 3 JIG BORER
Locates and bores holes to less than a "tenth"

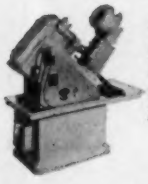
MOORE No. 3 JIG GRINDER
Locates and grinds holes to less than a "tenth"



MOORE UNIVERSAL MEASURING MACHINE
Measures to one-third of a "tenth"

MOORE ROTARY TABLE
Divides the circle to less than 2 sec.

Such accuracy is easily held on Snow machines. They show up best on hard-to-hold, tough steel parts where accuracy and quick changeover are important. They cut production costs, help you to make reliable deliveries of high quality parts. Snow has 3 types of machines for tapping (see below). On your next job let us show you what the Snow method can do. We invite samples and prints.



SNOW NUT TAPPER (like above). Hopper can select flanged nuts FACE DOWN.

SNOW HORIZONTAL MACHINE For special parts that need clamping. Hopper or hand feed.

SNOW VERTICAL MACHINE For short runs on a quickly changed dial index plate.

Snow Manufacturing Co., Dept. A, 435 Eastern Avenue, Bellwood, Illinois. Telephone, Chicago, EStebrook 8-7142

SNOW *master fixtures save dollars and days in tooling costs*

What does "Blanchard Ground" mean? Well, a glance at this sample case would show that it means finishes as fine as 2 microns. And a quick check with the optical flat below would show flatness to within 1 light band. What's more, Blanchards provide high precision, high production grinding of materials ranging from glass and stone, thru gems and plastics, as well as ferrous and non-ferrous metals. Equally efficient at hogging, too. Send for "The Art of Blanchard Surface Grinding" and get the whole story.
BLANCHARD GROUND
2MU
4MU
8MU
15MU
30MU
PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 State Street, Cambridge 39, Massachusetts

SANDVIK Coromant

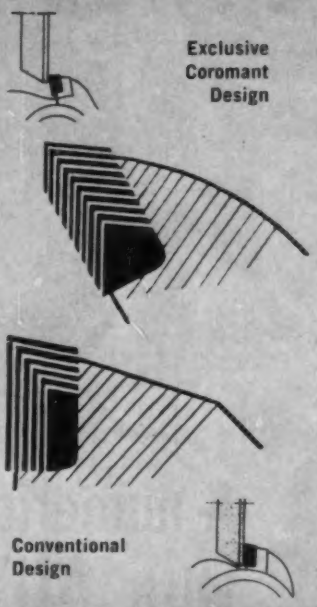
Exclusive "Tooth-Saver" Design Increases Cutter Life 40%

- Surface speed range from 100 to 800 ft. per min. depending on application
- Special design features make them usable on machine tools where conventional carbide mills cannot be used

Coromant S 26 Carbide-Tipped Shell End Mill. For face milling and square shoulder milling. In 3 sizes

40% LONGER TOOL LIFE + FASTER, EASIER REGRINDING

You simply grind a suitable primary land along the cutting edge rather than taking off the entire top surface of the blank as required by conventional mills. Coromant saves time and grinding wheels. Since you grind the length of the insert rather than the cross section, you retain far greater tip thickness for the life of the cutter than is possible with conventional designs.



EASIER, MORE ECONOMICAL CHANGE OF RADIAL RAKE

Coromant cutters have extra "angle capacity" . . . require less carbide removal . . . are more easily applied to the difficult machining jobs **including the new, exotic metals.**

For complete data on all sizes of these Coromant mills ask for this free folder.

Coromant S 27 Carbide-Tipped Shell End Mill. For heavy duty face milling. In 3 sizes.

SANDVIK STEEL, INC.

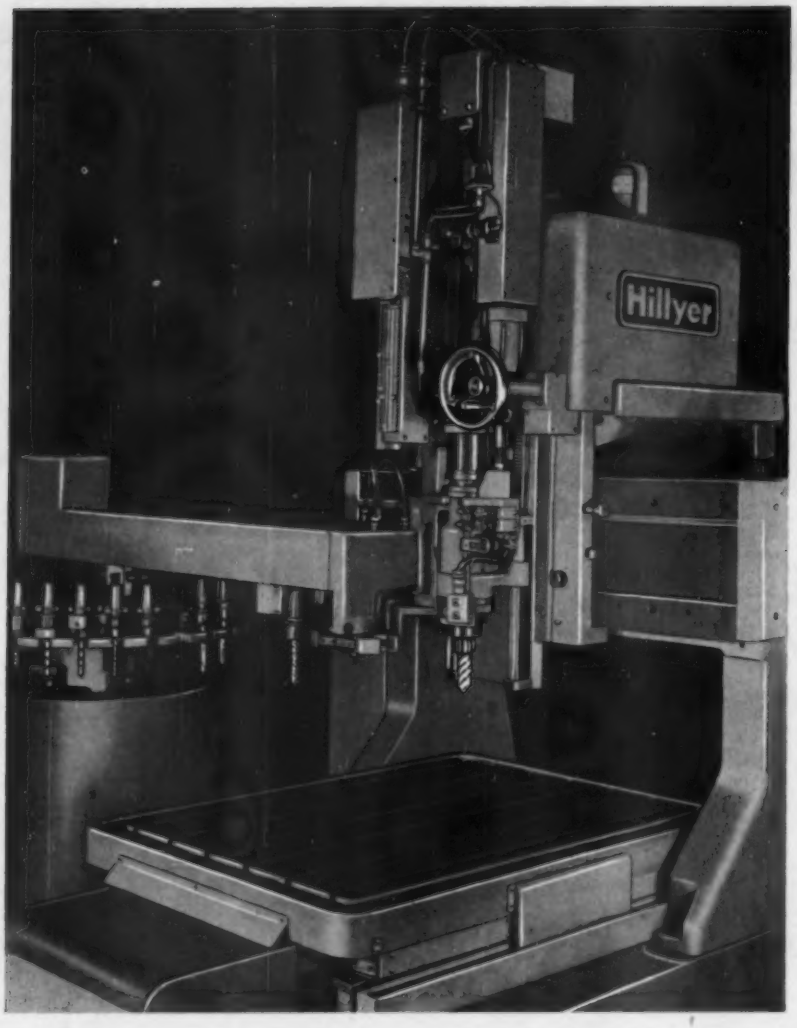
1702 Nevins Road, Fair Lawn, N. J.
SW 7-6200 • In N.Y.C. AL 5-2200

CLEVELAND • DETROIT • SKOKIE, ILL. • LOS ANGELES

In Canada
SANDVIK CANADIAN LTD., Montreal, Toronto, Vancouver

65-225

Visit us at Booth No. 1041 during the ASTME Tool Show, N. Y. Coliseum, May 22-26.



A numerically-controlled drilling machine with AUTOMATIC TOOL CHANGER for just $41,500

Hillyer's new tape controlled drilling machine with AUTOMATIC TOOL CHANGER is **substantially less than its closest competition** — with features superior to them all! In addition to complete numerical control of all drilling, reaming, tapping and straight-line milling operations, the Model TC-36C automatically changes tools as designated by dial or tape. Any combination of spindle speed, feed rates, or depths can be selected at any time by dial or tape command. Any combination of these three variables can be selected at any time. And the machine permits a given tool to be programmed to varying levels and varying depths, all on the same work piece, all within a working range of 36" x 24". A total of 30 tools can be accommodated in the changer at any one time **— yet tool changing takes just seconds!** Complete cost: from $41,500. Write today for complete details to Dept. 321.

Hillyer
CORPORATION
331 Centennial Ave., Cranford, N. J.

SEE IT AT BOOTH 3918, ASTME SHOW

"I Know Every Tool Steel Grade and Size in Warehouse Stock"

Thanks to the Allegheny Ludlum STEELECTOR

"We simplified tool steel selection immensely when we started using the A-L STEELECTOR System. It slashed our selection time to seconds. And our local warehouse always has the grade and size we need in stock—ready for immediate delivery.

"Here's how we use the STEELECTOR System: We check bar graphs of the STEELECTOR Card for the job at hand (there are cards for hot work, high speed, and tool room grades) to compare the abrasion resistance, toughness, size stability, machinability, and red hardness of the STEELECTOR grades. In seconds we can pick the best combination of properties.

"We confirm our selection with the STEELECTOR Data Stock List. (There is a List for each STEELECTOR grade.) The Data Stock List itemizes every size and shape in stock. It tells us before we order that the particular grade and size we need is ready for immediate delivery. The STEELECTOR System and quick warehouse delivery have enabled us to reduce our own inventory.

"The Data Stock Lists also tell us proper hardening, tempering, and annealing temperatures. The steel analysis and AISI number are listed along with a description of the steel's properties. And a list of suggested working hardnesses for typical applications serves as a check on our use of the grade."

The STEELECTOR System is remarkably easy to use. If you haven't investigated it yet, ask your A-L representative for your copy of the colorful, 10-page STEELECTOR Booklet, or write: ***Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania.*** Address Dept. AM-5.

8241

STEELECTOR PROGRAM

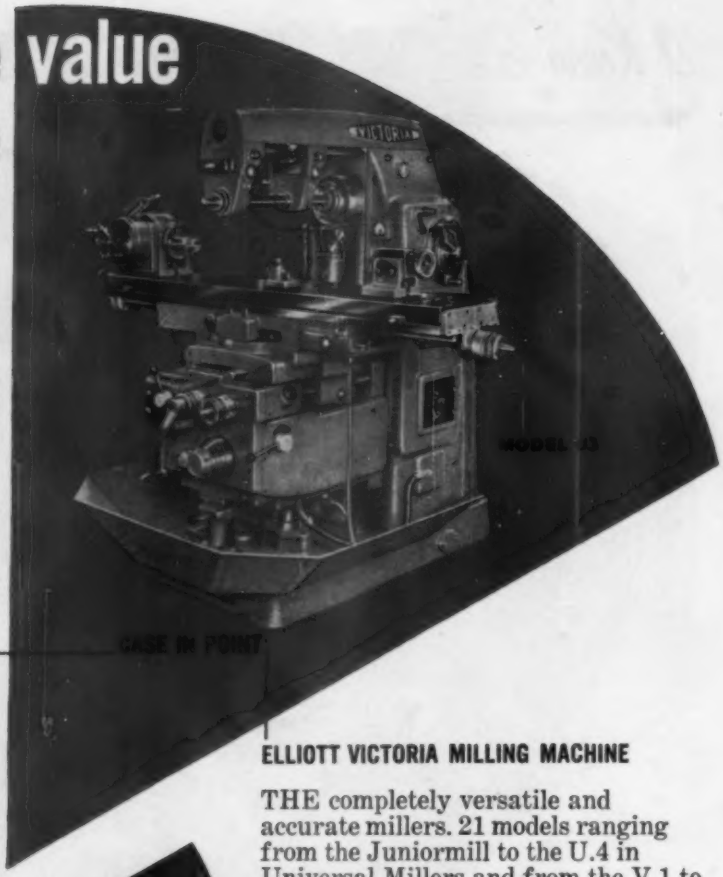
ALLEGHENY LUDLUM

Tool Steel warehouse stocks throughout the country

SEE ALLEGHENY LUDLUM AT BOOTH 2233 AT THE TOOL SHOW

you get more value with the ELLIOTT VICTORIA MILLING MACHINE

The diversification of precision machine tools manufactured by ELLIOTT are designed to fulfill your very specialized needs.



CASE IN POINT

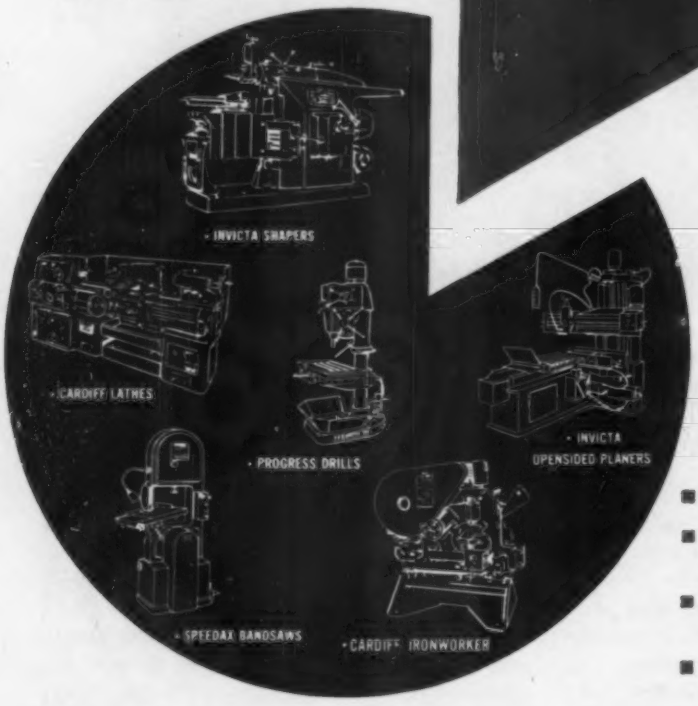
ELLIOTT VICTORIA MILLING MACHINE

THE completely versatile and accurate millers. 21 models ranging from the Juniormill to the U.4 in Universal Millers and from the V.1 to the V.4 in Vertical Millers.

HEAVY DUTY YET COMPACT

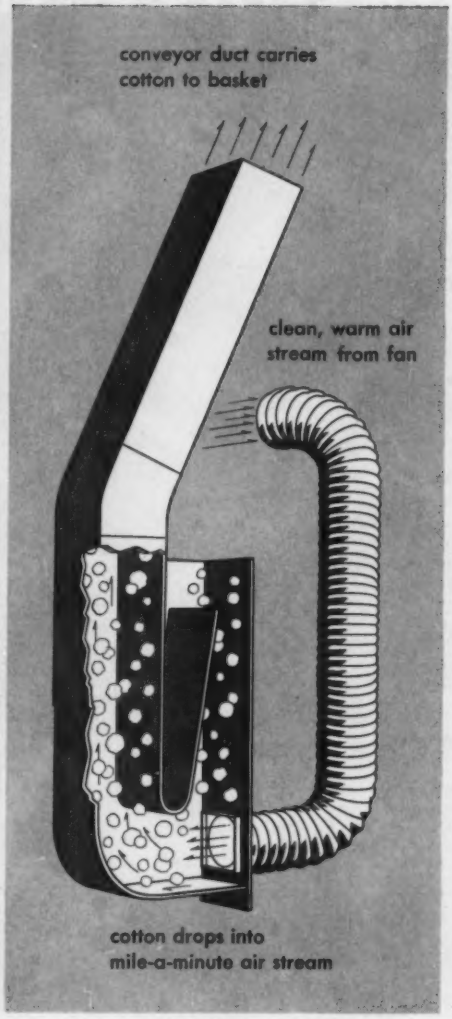
Exclusive features designed to reduce production costs and to increase safety, speed and dependability:

- universal, plain and vertical models.
- automatic and rapid traverses all directions.
- total 54 feeds in 3 ranges .6" to 36" per minute.
- 12 speeds to spindle, inverted chain tooth drive from 8 h.p. motor.



ELLIOTT MACHINE TOOL Manufacturers (a division of the world's foremost machine tool manufacturers) fulfills the demand for quality MACHINE TOOLS and competitive pricing "backed" by all the advantages of domestic machine tools: ■ Factory Distribution and Service ■ Controlled Dealer Franchises ■ Frequent Personal Contact with our Executives ■ Full Inventory of Spare Parts ■ Factory Service Engineers ■ Factory Technical Service. HOME OFFICE AND PLANT: Port Hope, Ontario/LOS ANGELES, CAL.: 1128 Crenshaw Blvd./BOSTON, MASS.: 19 Brook Street, Needham Heights, 94/HACKENSACK, N. J.: 333 Main Street

ELLIOTT ELLIOTT OF LONDON **MACHINE TOOL MANUFACTURERS**



Flexible Tubing helps carry cotton a-mile-a-minute through new Allis-Chalmers Picker . . .

Proof that today's designers can make Flexible Tubing do almost anything

In the newest Allis-Chalmers Cotton Picker, a jet air stream catches the cotton, and blows it — a-mile-a-minute — up conveyor ducts to the basket. Carrying this high-speed air stream from fan to picking units: Flexible Tubing's nonmetallic "Flexflyte."

Allis-Chalmers designers chose "Flexflyte" for two reasons: (1) it provides a fast, easy way to connect the fan outlet to the picking unit — a way that permits the unit to be raised and lowered on the job; (2) it makes extremely tight bends without collapsing.

If you work on any kind of original equipment where the handling of air, gases, liquids, or light solids is a design problem, there's a Flexible Tubing product just right for the job. Flexible Tubing is at work today in space age products, vacuum cleaners, diesel engines, tape recorders . . . literally hundreds of places. Call your nearest Flexible Tubing regional office today.

Flexible Tubing
CORPORATION
24 New Whitfield St., Guilford, Conn.
Anaheim (Los Angeles) • Hillside (Chicago)
Atlanta — Cleveland — Dallas — Dayton — San Francisco — Wichita

•MACHINES UP TO 50% FASTER
•LENGTHENS TOOL LIFE

Uniloy 303MA is a free machining grade of chromium-nickel stainless steel developed by Universal-Cyclops. It has been proven greatly superior to AISI Type 303 in key plants throughout the country.

Production tests have proved that Uniloy 303MA machines up to 50% faster than Type 303. Cutting tools last longer, decreasing tool cost and machine down time. Completed parts have a better finish than is possible with Type 303, and the corrosion resistance is far superior.

*Patent No. 2,900,250

Send for a copy of our new brochure containing complete data on Uniloy 303MA, and for Performance Reports citing dollar savings achieved by satisfied customers.

Contact your nearest Universal-Cyclops steel service center or sales office. Uniloy 303MA is AVAILABLE FOR IMMEDIATE DELIVERY.

UNIVERSAL CYCLOPS
UC STEEL
STEEL CORPORATION
EXECUTIVE OFFICES: BRIDGEVILLE, PA.

STAINLESS STEELS • TOOL STEELS • HIGH TEMPERATURE METALS

CIRCLE 499 READER SERVICE CARD

Two new Durasafe models—

For greater protection . . . easier acceptance

Here are two new Durasafe safety glasses that will help make your eye safety programs *work*. Both give workers the type of protection they need, want, and will wear. The plastic and metal Safemaster (F5300) was designed for safety Rx as well as plano lenses. The Flexi-Fit (F9900), which fits 85-90% of plano users, helps you cut plant stocks of sizes, is also available for Rx. Both models give you major Durasafe features.

For better wearer acceptance and greater eye safety, check these durable new Durasafe models. Call your AO Safety Products Representative, or write for bulletin S-1524.

Only AO Durasafe gives you:

Sturdy frames—engineered for industrial use and exposures.

Wider temples, endpieces—stronger, more comfortable, better appearance.

7-Barrel hinges—40% stronger at temple's most vulnerable spot.

Duragrip screw construction—temples stay tight, screws cannot fall out.

Cool side shields—nonreflecting wire mesh.

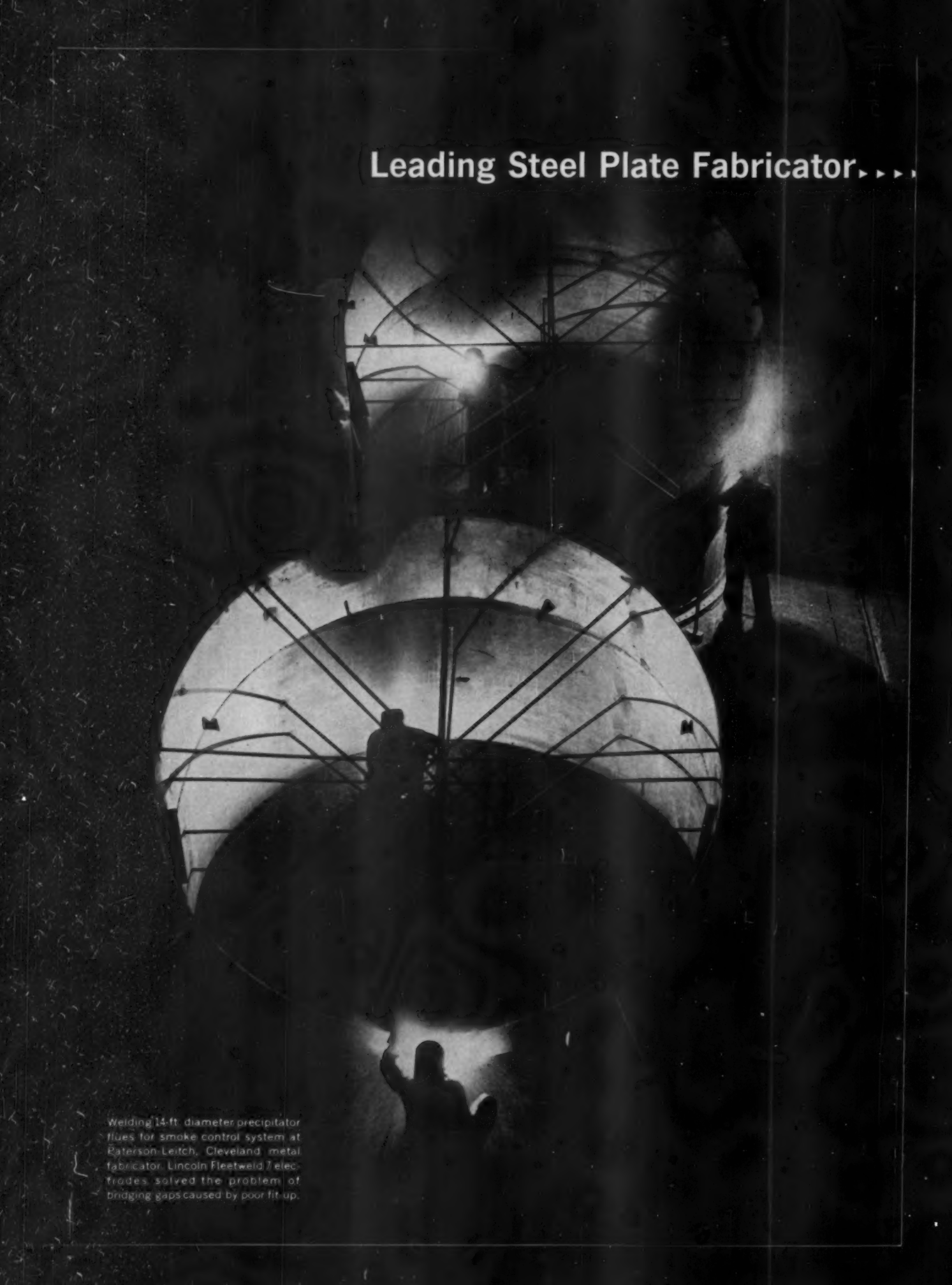
Choice of temples—wide plastic comfort cable, metal core plastic spatula, or aluminum with plastic spatula tip.

Your Surest Protection . . . AO SURE-GUARD Glasses

American Optical COMPANY

SAFETY PRODUCTS DIVISION • SOUTHBRIDGE, MASSACHUSETTS

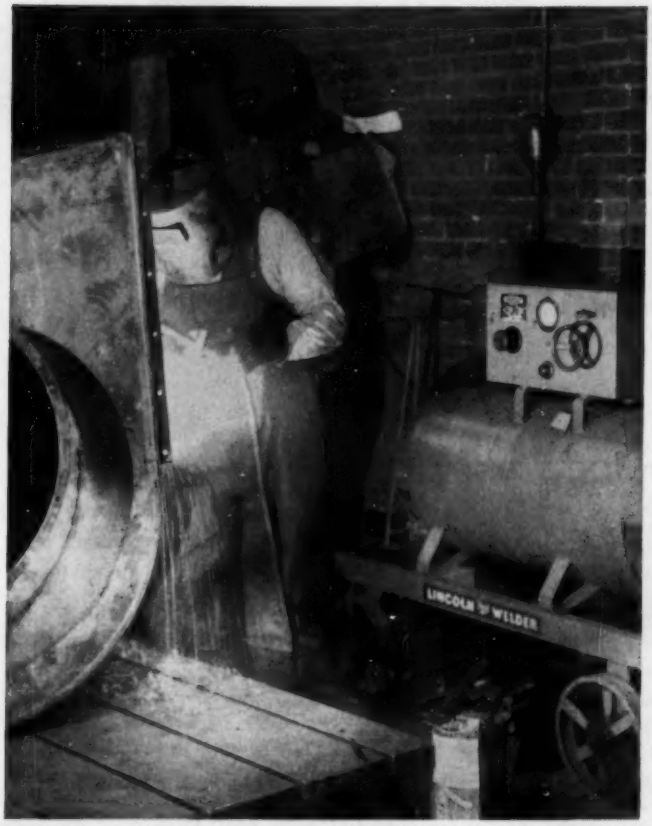
Leading Steel Plate Fabricator....



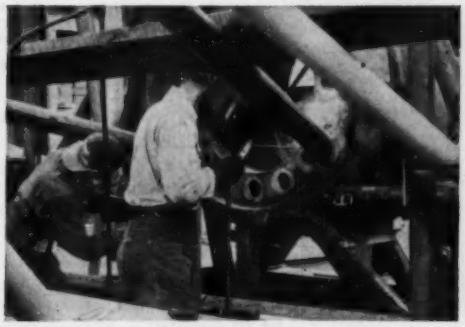
Welding 14-ft. diameter precipitator flues for smoke control system at Paterson-Leitch, Cleveland metal fabricator. Lincoln Fleetweld 7 electrodes solved the problem of bridging gaps caused by poor fit-up.

▸▸▸▸ELIMINATES FIT-UP PROBLEM WITH LINCOLN FLEETWELD 7 ELECTRODE

Fleetweld 7 is particularly suited to jobs with poor fit-up. Fleetweld 7MP has iron powder added to its coating to get still higher speeds, greater deposition rates. But, these are only two of a whole family of Lincoln Fleetweld electrodes for welding mild steel.



Here, Fleetweld 37 is used to weld fan blower housing. Its easy operation, fine appearance are important in all-position welding. Fleetweld 7MP, metal-powder brother to 7, is excellent where both speed and bead appearance are important.



Fleetweld 5, best-known electrode ever made is an all-purpose, all-position electrode, excellent for maintenance and general welding jobs. Another Fleetweld electrode, 5P, though generally similar to 5, was expressly designed to give the finest X-ray results on pipe. Fleetweld 35 is identical to 5 except it is for use with AC welders.

Each Lincoln electrode has been designed to do a particular job particularly well. Be sure you select the right one for your job. Call your local Lincoln welding specialist. No obligation, of course. Meanwhile, get your copy of the Lincoln Weldirectory, your guide to welding electrode selection. Write, The Lincoln Electric Company, Department 1631, Cleveland 17, Ohio.

LINCOLN ELECTRODES

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT AND ELECTRODES

PUT YOUR FINGER ON THE PRICE!

ORDER SLOT DIES FROM STOCK!

An exclusive with Oberg—Customers can shop for a Carbide Slot Die at their desks. Oberg makes it that easy with an exclusive pricing chart*. Check it carefully and then "presto"—you have the actual cost of your Die's parts! Otherwise, negotiating for price and delivery take so much time.

Oberg will start production at once upon receipt of your order and all information. Carbide for die sections and punches, and the material for holders and blocks are in stock *in the plant* . . . set to go! Just mail your selections with complete specifications. Oberg will take over from there. Delivery time 7 to 10 days!

Oberg is something special

Oberg Manufacturing Co., INC.

FREEPORT, PA.

VISIT BOOTH 2146 ASTME SHOW

Send today for Bulletin 258 with latest Oberg Standard Slot Die Pricing Sheet (Revised May 1, 1961)

LOWER PRICES . . . MORE COMPLETE COVERAGE . . . NEW STANDARD STYLES!

CIRCLE 503 READER SERVICE CARD

PIONEER AMERICAN STANDARD.

Over 40,000 in use. Accurate, non-marring hardness testing on small or massive objects such as rolls, lathe beds etc. Model C-2 (above) or Model D with equivalent Brinell or Rockwell C numbers. Repair and calibration facilities at your disposal.

INSTRUMENT & MFG. CO., INC.

90-35 VAN WYCK EXPRESSWAY JAMAICA 25, N.Y., U.S.A.

CIRCLE 504 READER SERVICE CARD

Maximum Utility, For Precision Work . . . at less cost!

LINLEY JIG BORERS

Designed by toolmakers for toolroom work

The Linley Jig Borer is accurate to a high degree. It is fast to set up and position and has the versatility required for precision tool room and die work, yet is low in cost.

Many time-saving accessories are now available for use with the improved Linley that add to its usefulness and simplify its operation. Check on the many advantages of this improved jig borer. Table size is 7" x 17½"; table travel, 6½" x 10".

Send for descriptive literature.

LINLEY BROTHERS CO.

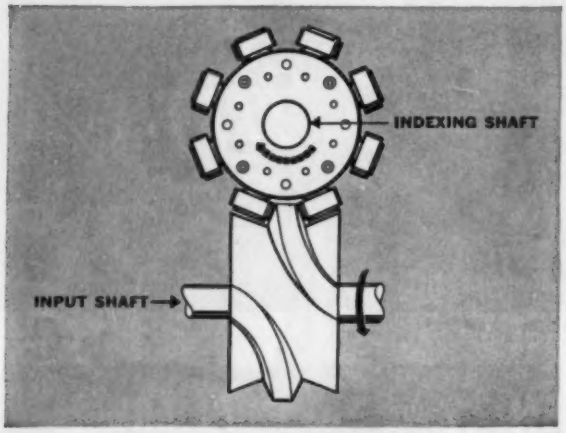
664 State Street Ext.

Bridgeport 1, Conn.

CIRCLE 505 READER SERVICE CARD

How Ferguson *ELIMINATES BACKLASH* in Index Tables

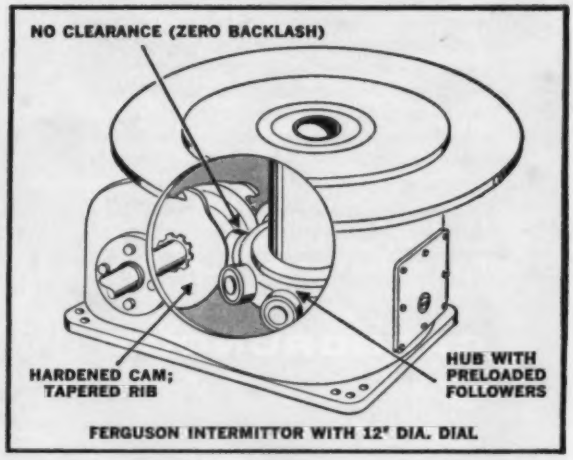
Backlash in indexing results in shock loads that affect the efficiency of a machine and the quality of its product. Most indexing mechanisms have inherent characteristics that cause backlash and poor dynamic conditions and prevent the designer from taking full advantage of modern feeds, tooling and methods that contribute to production economy.



Ferguson Intermittor Index Tables have inherent zero backlash and extreme precision which results in a rotary transfer machine base capable of operating speeds up to 500 indexes a minute. *A Ferguson index table never proves to be a limiting factor in the speed or performance of an automatic assembly machine.*

HERE'S WHY: The continuously rotating cam of a Ferguson indexing mechanism features a *tapered rib* along which two preloaded bearing followers roll, maintaining constant contact with no clearance between them and the rib. When the mechanism is in the rest, or dwell, position, a straight portion of the rib locks the followers with zero backlash and an indexing accuracy of .001". Wear on the hardened tool steel cam is infinitesimal (many have been in use for more than 25 years). Followers are rated for a minimum of 8,000 hours operation. If backlash occurs after this period the life of the drive may be renewed merely by replacing the standard followers.

NOTE HOW PRELOADED FOLLOWERS ENGAGE RIB



FERGUSON INTERMITTOR WITH 12" DIA. DIAL

Compare this with other types of indexing devices. A geneva drive, with its slotted wheel and driver, and a barrel cam with a grooved track which engages one follower at a time, must have clearance in the slot or groove to allow passage of the follower. The slightest amount of clearance causes backlash. As the slot or groove wears, the clearance becomes greater and the backlash condition worsens. At the higher, more profitable operating speeds poor dynamics cause wear on other parts of the machine. The user must choose between frequent downtime for repairs or slower speeds . . . He is the loser in either case.

FREE DESIGN DATA — Load ratings, dimensions and application and installation information about standard and stock Intermittors, Ferguson Drives and in-line machines are contained in a single 36 page catalog. Every designer should have one in his library . . . Write Ferguson—Ask for Catalog No. 160.

See us at the ASTME Show, New York

FERGUSON MACHINE COMPANY

A Division of Universal Match Corporation

7818 Maplewood Court • St. Louis 17, Missouri

high speed sheet polishing

Pneumatic abrasive belt tensioning. Constant through feed using CURTIS-originated conveyor belt principle. Simplified single control stock thickness adjustment—all features of the Model 150 CT. Designed to produce better finishes at higher speeds and at lower cost . . . on *any* flat metal surface. This fine quality precision machine is another product of long experience in abrasives, abrasive machines and machine methods . . . by Curtis-Carborundum.

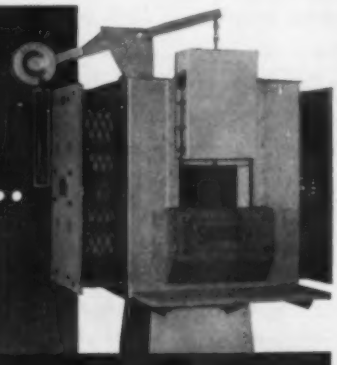
For your copy—Model 150 Brochure write to: Curtis Machine Division, The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM

CURTIS

MODEL 150 CT
Abrasive Belt Polisher

CIRCLE 507 READER SERVICE CARD



RIGHT NOW... You Need SENTRY ECONOMY

To offset rising costs and meet price competition you must save money by increasing production efficiency. In your tool room, a Sentry high speed steel hardening furnace with the truly neutral Diamond Black atmosphere means immediate savings.

- low initial cost
- quick heating
- simple operation
- no tool spoilage
- no scale no decarb
- no finish grinding
- consistent quality

For demonstration, bring tools to Booth 1724, ASTME Tool Show.

Sentry ELECTRIC FURNACES

Request Catalog 18-H • Write THE SENTRY CO., FOXBORO, MASS.

CIRCLE 508 READER SERVICE CARD

NEW IMPROVED LOW COST UNIVERSAL Karge Turnomat PROFILE TRACER TOOL

Fits all lathes, screw machines, boring mills from ½ to 30 HP.

BASIC UNIT $595

Template service and pilot test runs available

PAT. PEND.

Copy turn work pieces, from bar stock ¼" to 3½" diameter, in one pass to unlimited shapes, lengths and diameters. Precision ∓.0005" or better. Copy face or bore turn to all diameters. No hydraulics.

TURNOMAT CO. INC. Brockport, N. Y.

CIRCLE 509 READER SERVICE CARD

LOOKING FOR HIGHER EFFICIENCY AND LONGER LIFE IN RIGHT ANGLE DRIVES?

Then take a closer look at Philadelphia Spiral Bevel Reducers. They'll give you an efficiency advantage of 5 to 50% over other types of right angle drives . . . depending upon ratios.

HIGH EFFICIENCY. With efficiencies of 95 to 98%, spiral bevel reducers will lower your power costs . . . reduce the cost of prime movers.

HEAVY DUTY. The bearings and shafting in Philadelphia Spiral Bevel Reducers are designed for 185% overload. Spiral Bevel Gears and Pinions are hardened after they are cut, then lapped to a mirror finish. Helical gearing in multiple reduction units is precision hobbed and shaved from through-hardened alloy steel. Result: greater load carrying capacity, longer life.

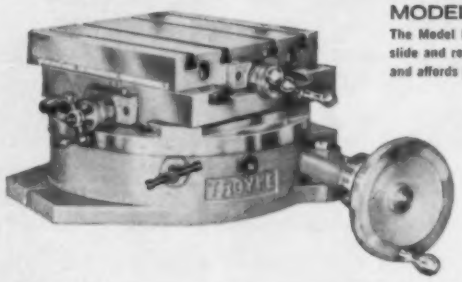
COOLER RUNNING. Compared to other types of right angle drives, Philadelphia Spiral Bevel Reducers run cooler. Separate cooling systems are not needed for most applications.

COMPLETE LINE. Philadelphia Gear offers the most comprehensive line of Spiral Bevel Reducers available — or we can build specially engineered units to meet any special requirement. Ratios from 1:1 to 238:1. Single, double or triple reductions in either vertical or horizontal types. Catalog SB-60 gives full selection data. Write on your company letterhead for your copy.

philadelphia gear drives

PHILADELPHIA GEAR CORPORATION
King of Prussia (Suburban Philadelphia), Pennsylvania

TROYKE *presents*
TWO NEW MODELS OF CROSS SLIDE TABLES



MODEL DMT-15

The Model DMT-15 is a combination of a cross slide and rotary table built into one rugged unit, and affords precision X, Y and rotary positioning.

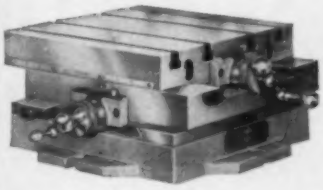
To meet the demand for a precision cross slide rotary table at a reasonable price, Troyke Mfg. Co. has developed two new models.

The experience and "know-how" derived from building thousands of rotary and indexing tables has gone into the development of these new products.

These tables are low in cost and pay for themselves in the time saved by elimination of many setups and relocation of work.

Although low in cost, many new features and greater accuracies are achieved.

WRITE FOR BULLETIN NO. 28



MODEL CS-12

The Model CS-12 is a cross slide table which can be used for precision positioning on X and Y axis. It can also be used in conjunction with standard rotary tables.

Manufactured in U.S.A. by

TROYKE MFG. CO. • *Cincinnati 41, Ohio*

"Rotary Tables are our Business"

CIRCLE 511 READER SERVICE CARD

From the *American Machinist* Library of *Tips for Top Shop Men*

BE MAN enough to stand up and fight for what you say and believe—or don't say it. If you're afraid of the boss, making remarks behind his back won't give you confidence.

New $300 precision cut-off saw paid for itself during 15 minute production run

Navkut*, the new precision cut-off saw, cut production costs substantially at Unicorn Engineering Inc. (now owned by Computer Measurements Company, Sylmar, California). $8 was once the cost of "spacers"—high precision parts which were originally cut from bar stock in a lathe, then milled and ground to a tolerance of .002". After buying the Navkut saw, the production of spacers was reduced to a simple cut-off operation, and costs were cut to 80c a spacer. During every 15-minute production run, the Navkut saw paid for itself. Today, over two years later, the same Navkut is still being used to great advantage in a wide variety of production work.

An operator can cut parallel tolerances to within .002" with the Navkut cut-off saw. And in most cases, the cut finish and accuracy are so precise there is no need for milling or grinding. The Navkut saw will cut ferrous, non-ferrous, wood, and plastic materials with only two types of blades. It sets up in just 1½ minutes. And yet, with all this precision, the Navkut saw costs only $300.

This is the ideal production cut-off for small shops; the ideal auxiliary cut-off for all shops. See for yourself how the Navkut saw can save you money. Write today for a free 15-minute demonstration in your shop.

*TRADEMARK

Navkut saw is another product marketed by:

NAVAN
INVENTION MARKETING NATIONAL SALES

NAVAN PRODUCTS INC.
Subsidiary of
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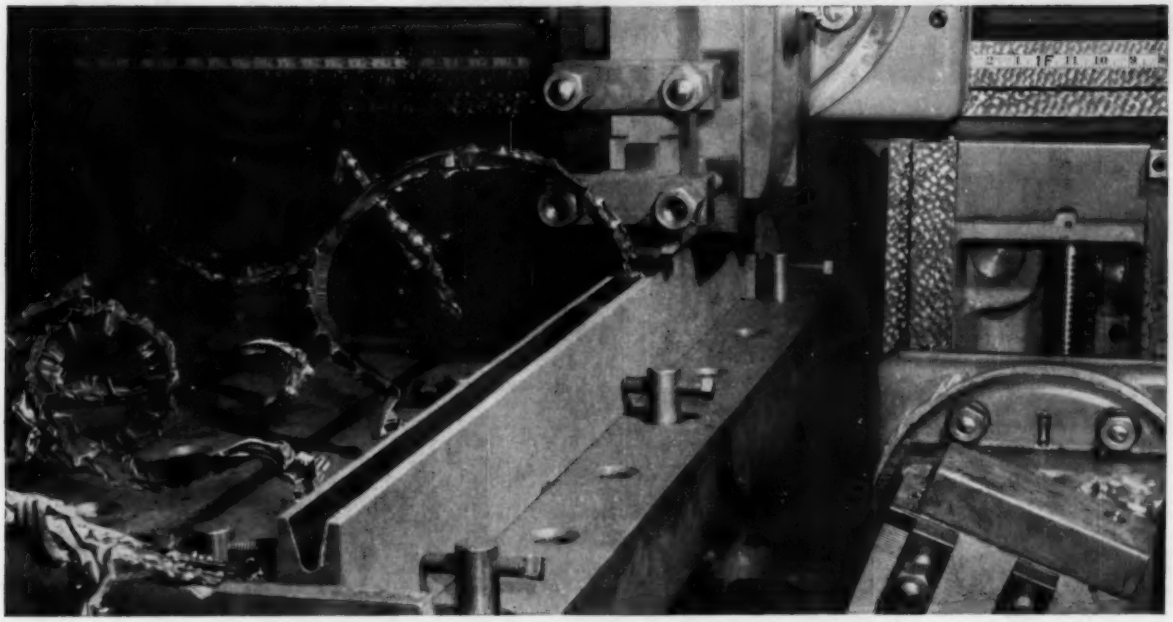

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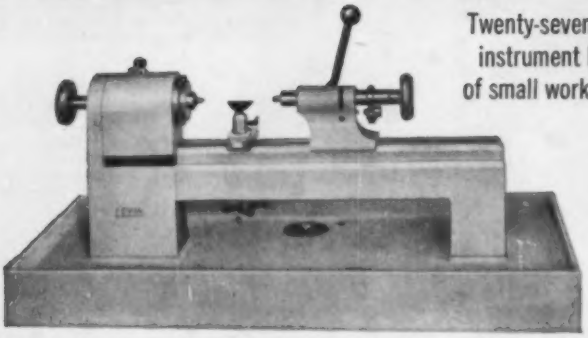
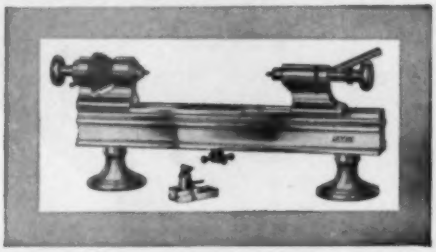
PRODUCE SMALL INSTRUMENT PARTS BETTER



Twenty-seven models of instrument lathes for all types of small work. Collet capacity 5/16" or 3/16". Levin Instrument Lathes are used wherever fine work is being done. Over 11,000 lathes in use.



For complete details of Levin Instrument Lathes and accessories send for catalog T.

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drill grinder with 7 new features:

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3. **Simplified dressing** — 2 self-sharpening diamond dressers for face and periphery of wheel
4. **New Rugged built-in web thinner** — for increased accuracy
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Black Diamond Drill Grinders: For #70 drill up to ¼"
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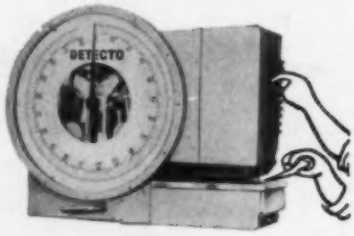

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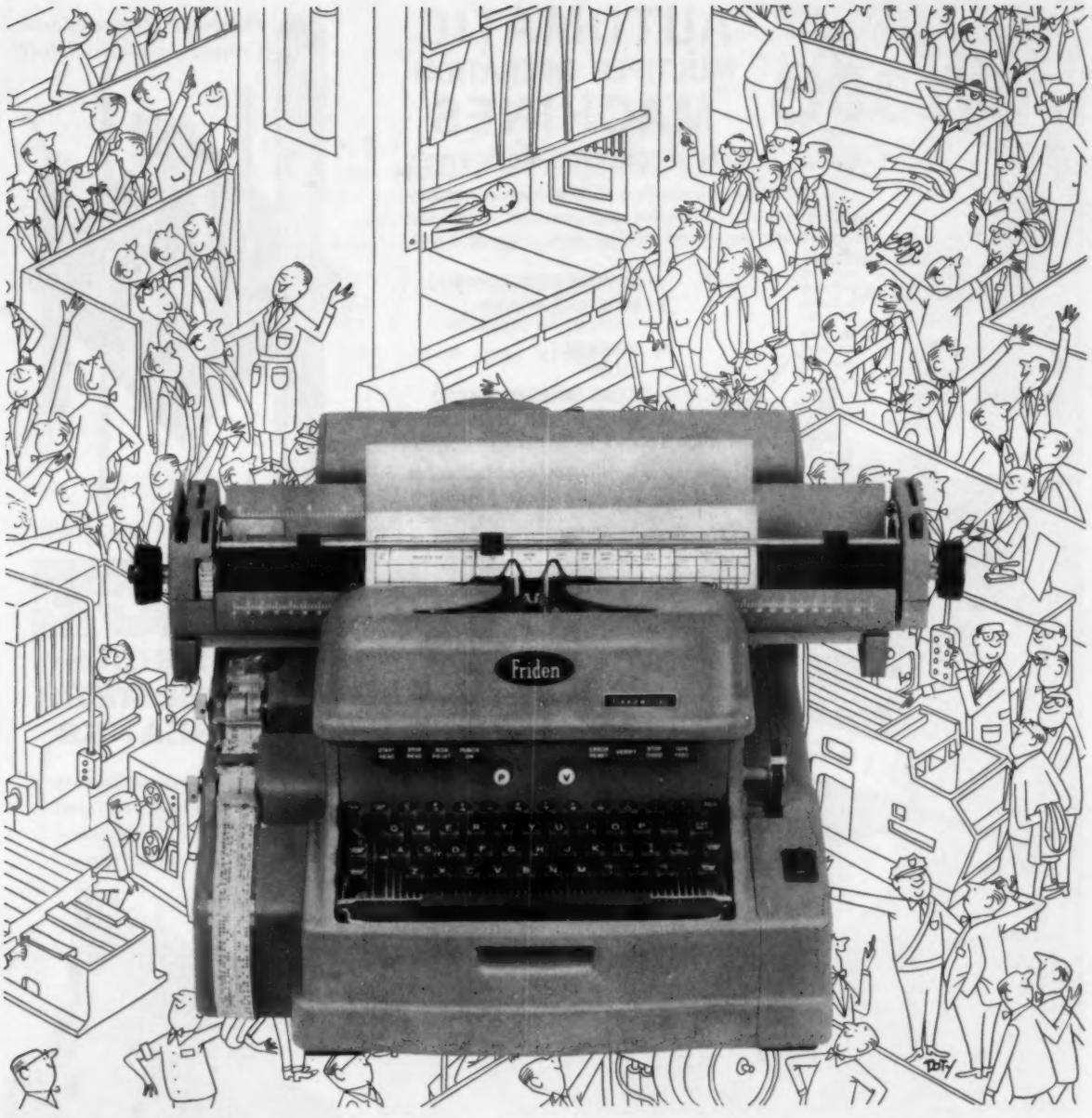

The Friden Flexowriter® Machine Tool's Machine Tool

At the recent Machine Tool Exposition, approximately 80% of the numerically controlled tools on display featured 8-channel punched paper tape input.

The toolmakers have shown this overwhelming preference for punched paper tape for several reasons:

1) the tapes are easy to prepare,
2) the coding is visible,
3) tape can't get out of sequence,
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THIS IS PRACTIMATION: Friden is the world leader in tape technology and the practical application of the automation it makes possible. For full information, call your local Friden Systems Representative. Or write: Friden, Inc., San Leandro, California. © 1961, FRIDEN, INC.

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- ★ MILL
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- ★ INSPECT
- ★ OUTSIDE THREADING
- ★ SCREW ASSEMBLY UPSET — POSITION
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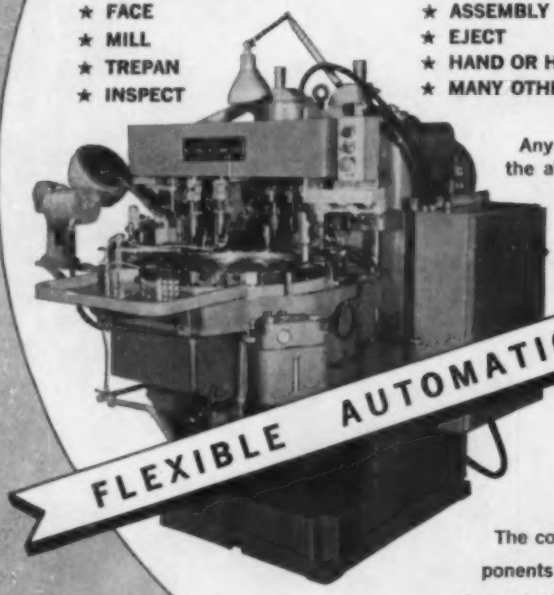
- ★ EJECT
- ★ HAND OR HOPPER FEED
- ★ MANY OTHER OPERATIONS



Any combination of the above operations may be performed in one cycle.

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Send us your specifications and let us show you how the Globe machine can minimize labor and improve quality.

The cost of small components and assemblies is kept within competitive price structure when they are produced and assembled on this Globe fully automatic, multiple operation unit.

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Stops Losses
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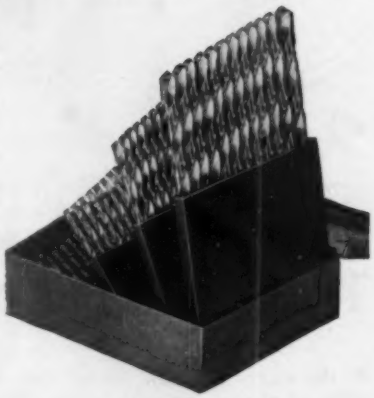

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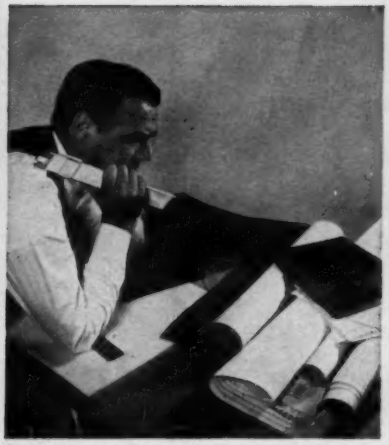
NEW TOOL STEEL SERVICE

helps you estimate costs more accurately!

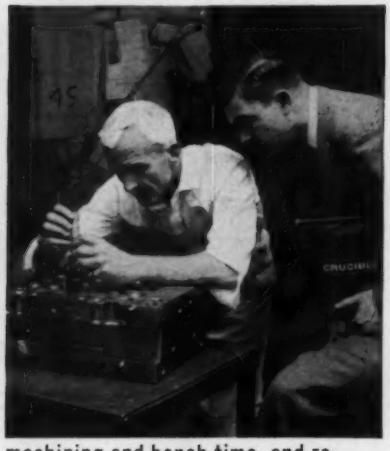


Estimating tooling costs, especially on new jobs,

becomes more accurate and profitable with Crucible's new Tool Steel Service.

This service enables you to use fewer grades of tool steels...

which you get to know inside-out! So, you can more accurately predict



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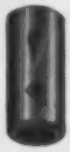

Die

Kwik-Pull Square Retainer

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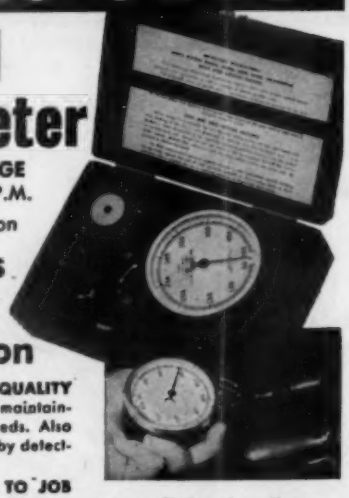
BROAD RANGE
50 — 5,000 R.P.M.
with stop button

assures better production



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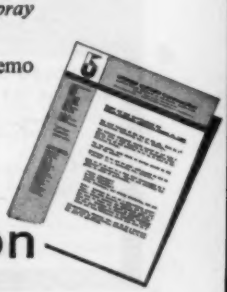

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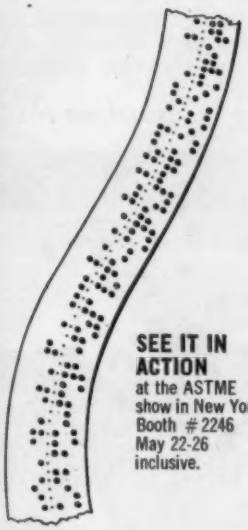

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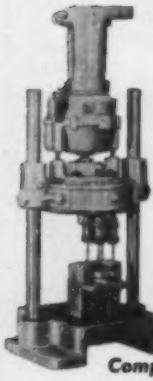

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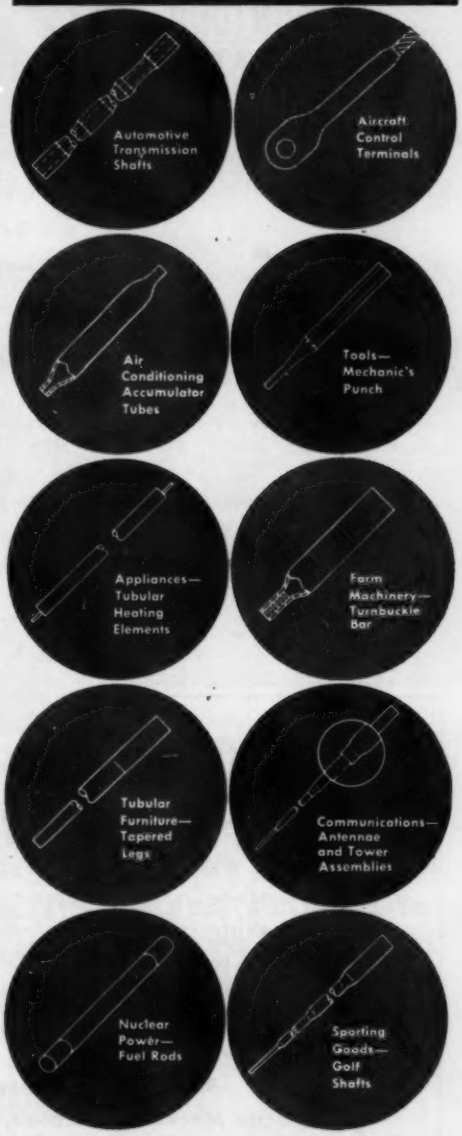

These versatile, efficient machines shape metal parts by hammering between dies instead of cutting stock away. They give you a full pound of parts from every pound of metal. They also save you time and labor. Swaging is usually the fastest way to point, taper, reduce or bond metal parts. Tooling is simple and surprisingly inexpensive.

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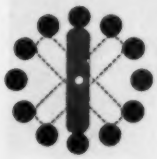

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converts Vertical Turning and Boring Machine

TO CONTOUR TURNING LATHE

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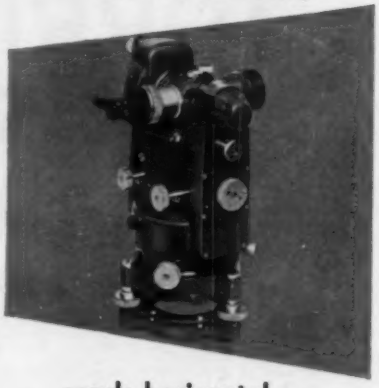

reads horizontal and vertical angles direct to 1 second of arc . . .

Convenient, portable, accurate, the Microptic Theodolite is an exact survey-type instrument with horizontal and vertical rotation for checking planes and measuring angles. It is the universal optical tooling instrument for setting up machine tools, radar antennas, atomic reactors, missile and ground support.

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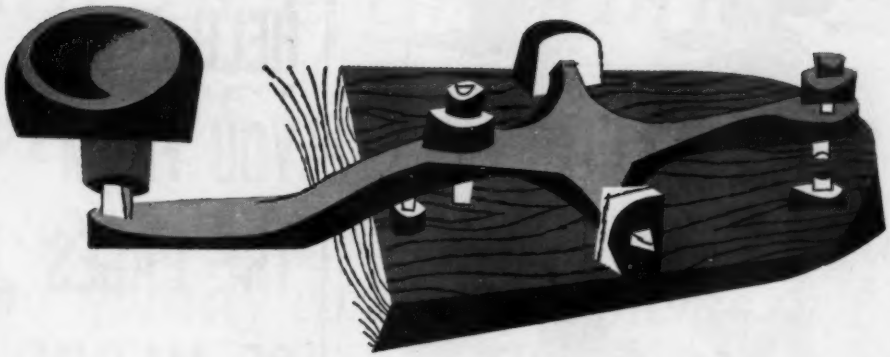

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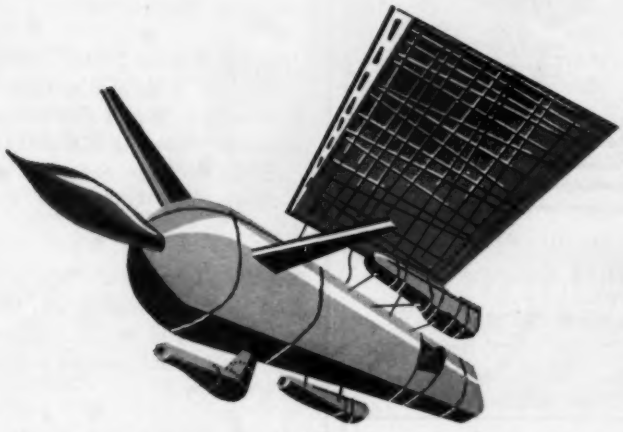

The telegrapher's key is a time-honored means of sending messages. However, it takes its place in the Dark Ages of Communications when compared with space satellites which will one day orbit the earth to make possible the instant transmission of messages to every point on the globe.

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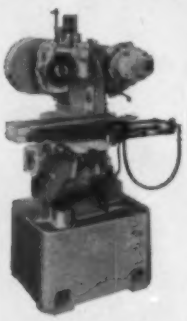
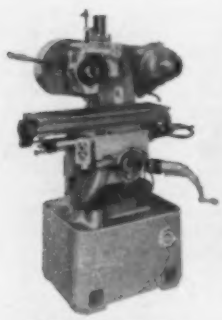


65A SEMI-AUTOMATIC—Automatic pneumatic table feed converts Standard Model to a fast high production unit.



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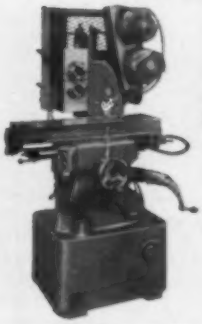

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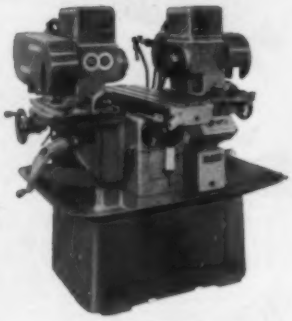

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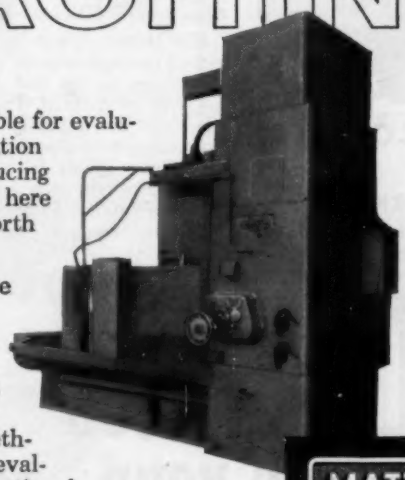

Are you responsible for evaluating new production methods and reducing costs? If you are, here are some facts worth considering.

Cost studies prove that QUICK-TILT surface grinding is a *new method*— not just a machine feature. It is a method which must be evaluated with conventional "big chip" machining. As such, it offers economies inherent only in grinding.

Power spindle tilting takes surface grinding out of the narrow category of a finishing process. This and other features have made it a basic development which can increase your ability to:

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3. **Increase return on capital**
4. **Improve product values**

Performance of our new grinders surpasses all previous standards by a considerable margin. That's why people are talking about "abrasive machining." What technical advances have created this difference? Primarily—three:

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How much can you save? Costs vary widely, but here are some examples: Meehanite tables, formerly planed, are being ground at a saving of $14.93 each. Total machining cost, including machine-hour charges, labor, wheel replacement, setup, and loading time, was reduced from $19.87 to $4.94 per piece. On a cast iron bracket, formerly milled, surface grinding is saving $9.83 per piece.

If you are interested in *abrasive machining*, send your pieceparts for a sample grind and cost estimate. Your Mattison dealer will make the arrangements.

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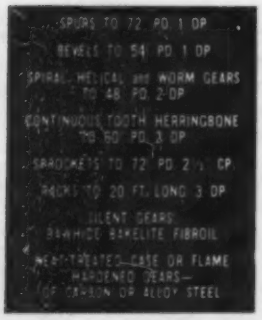
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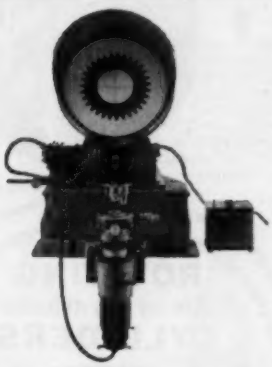
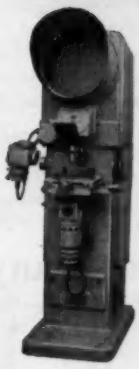
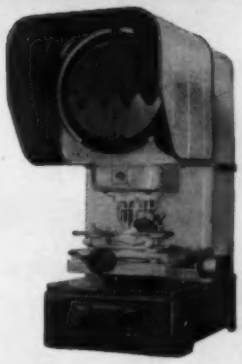


OPTICAL COMPARATOR—BENCH MODEL 2



OPTICAL COMPARATOR—FLOOR MODEL 3



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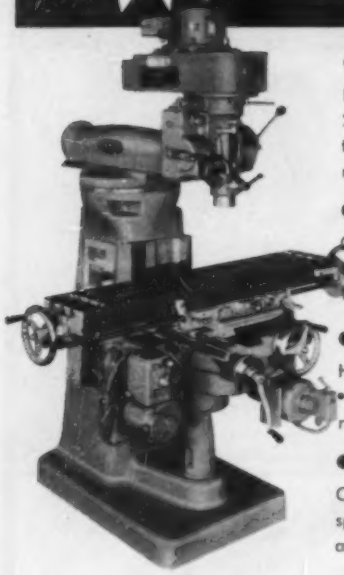

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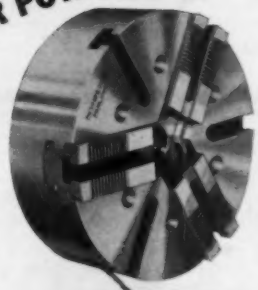

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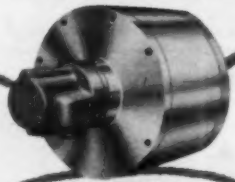

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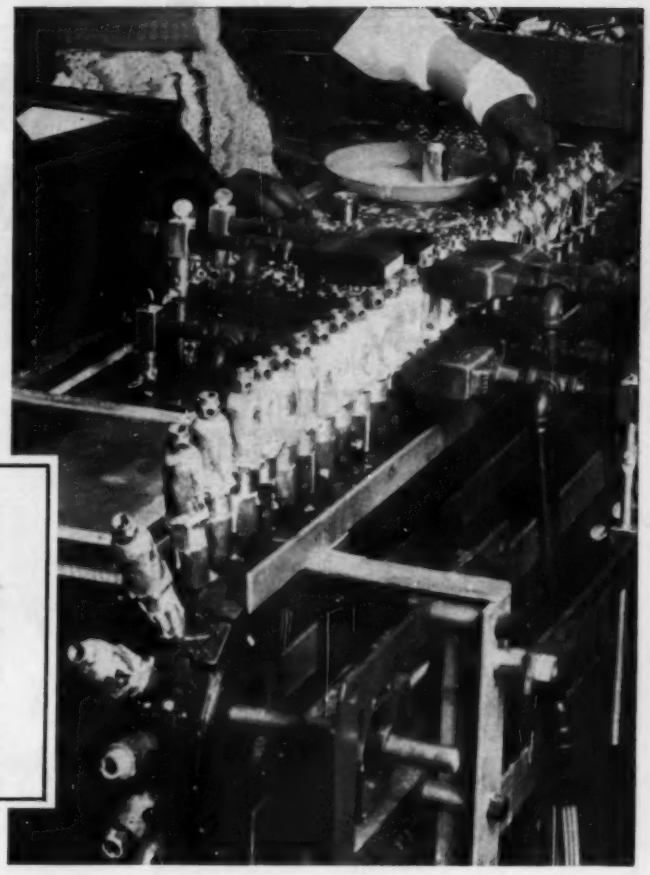

Operator dips parts in HANDY FLUX and assembles them with EASY-FLO 45 rings on a moving rig. Assemblies then pass between banks of gas burners to complete brazing process. Capillary action of EASY-FLO brazing alloy insures thorough penetration—guarantees high strength, leakproof joints.

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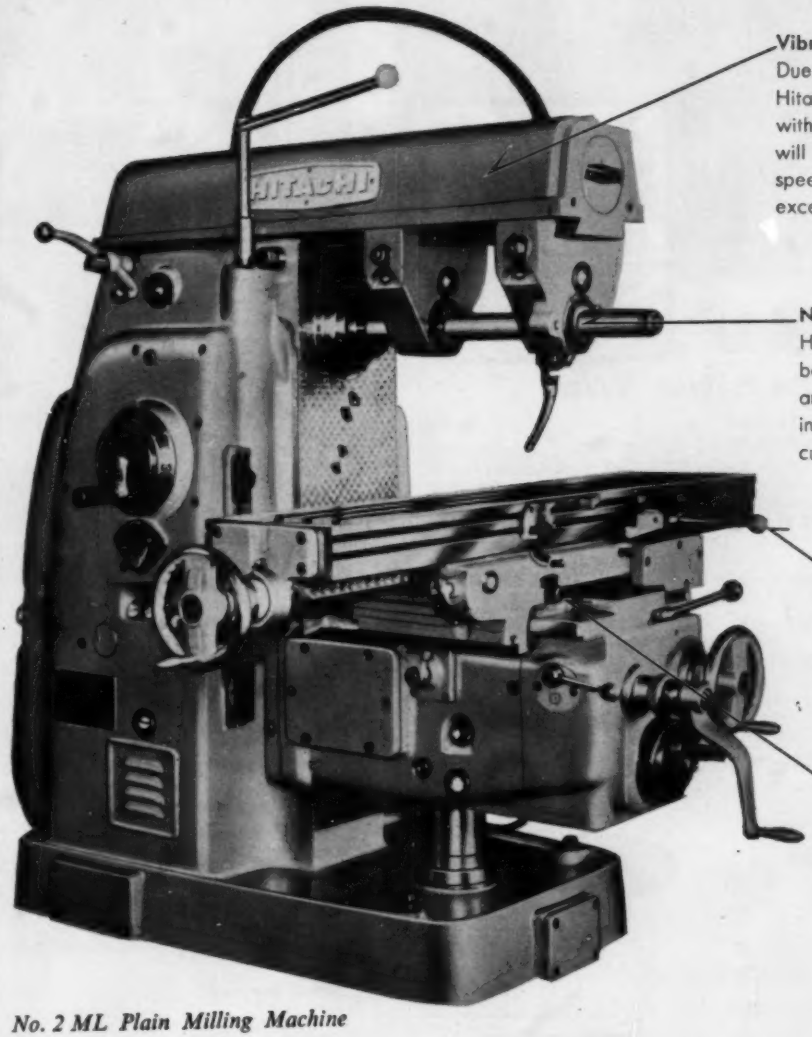

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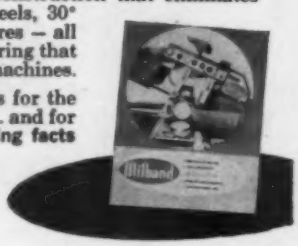

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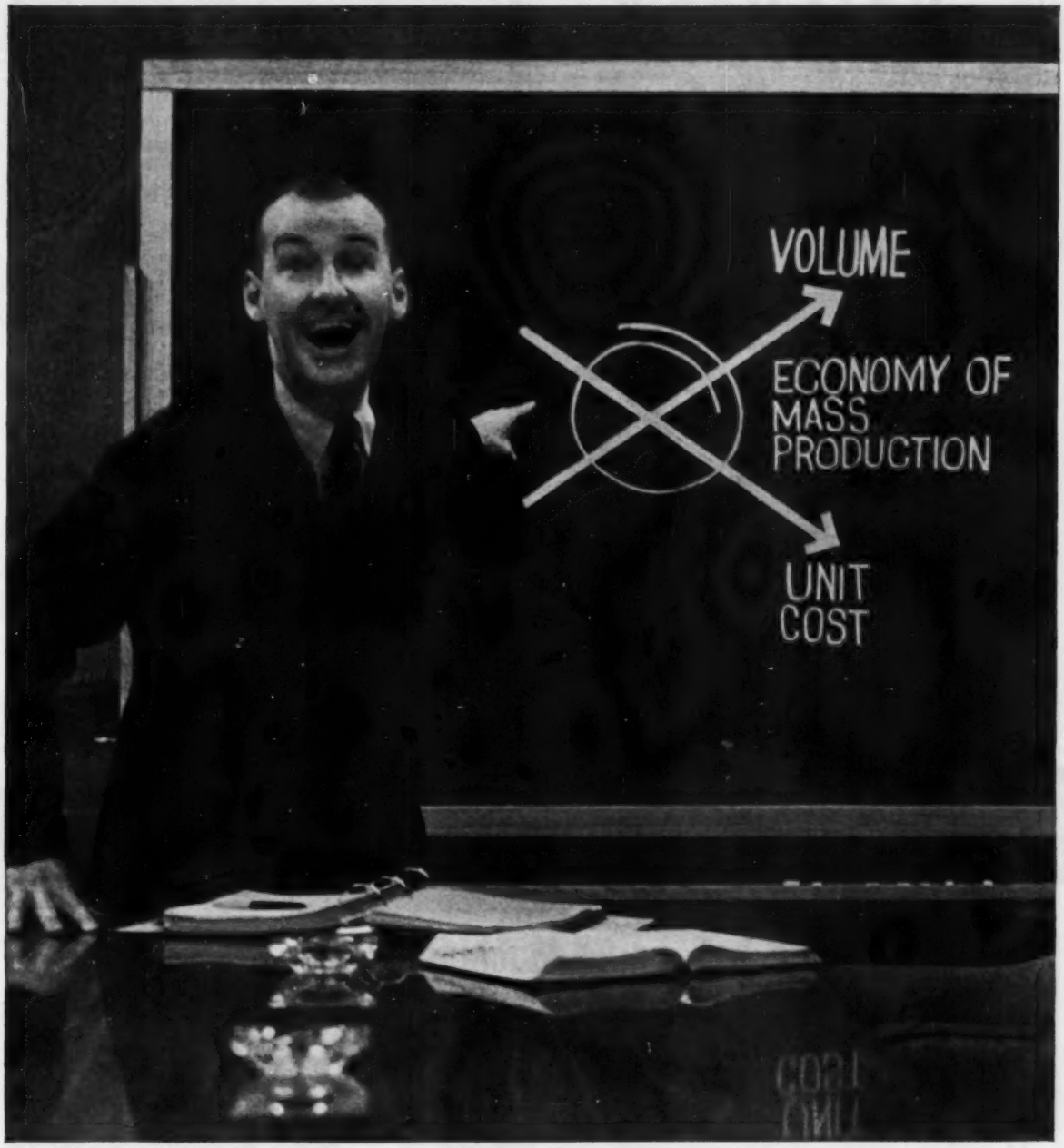

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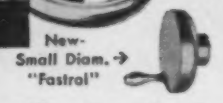

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3. Automatics
7. Boring Mills
8. Broaching Machines
11. Chucking Machines
13. Cranes, Overhead Traveling
17. Drilling & Reaming Machines
25. Gear Cutting Machines
26. Grinding Machines
31. Lathes
37. Milling Machines
42. Planers
45. Press Brakes
46. Presses
48. Rebuilding, Cranes, Electric Hoists
51. Roll Formers
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66. Welding Equipment
69. Electric Hoists

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*28-60 Cinc Vert Hydrotel 360° RCG
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**BE30 Mammut (German) Horiz. (1958)
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**V-20 Mammut (German) Vert. H.D. Univ.
**33—2448 Sundstrand Rigidmill 15 HP '52
*33—1448 Sundstrand 600 RPM (1944)
*36x96 Cinc. Hydrom., Simplex RCG

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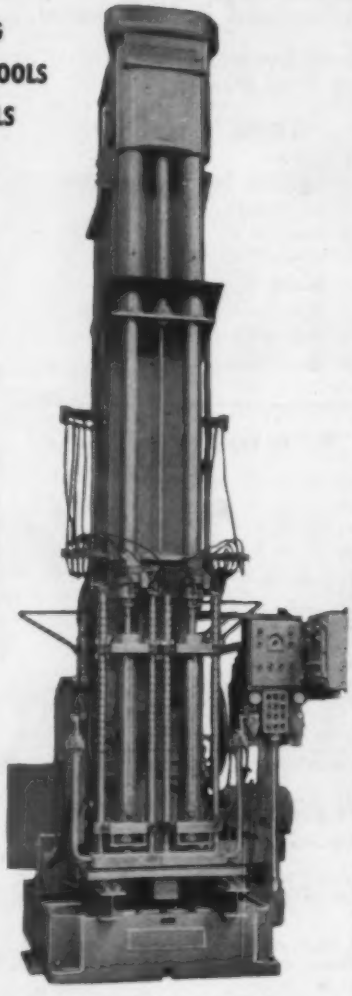

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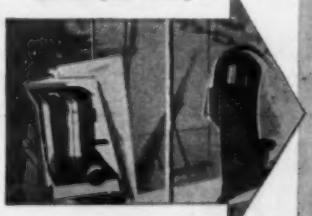

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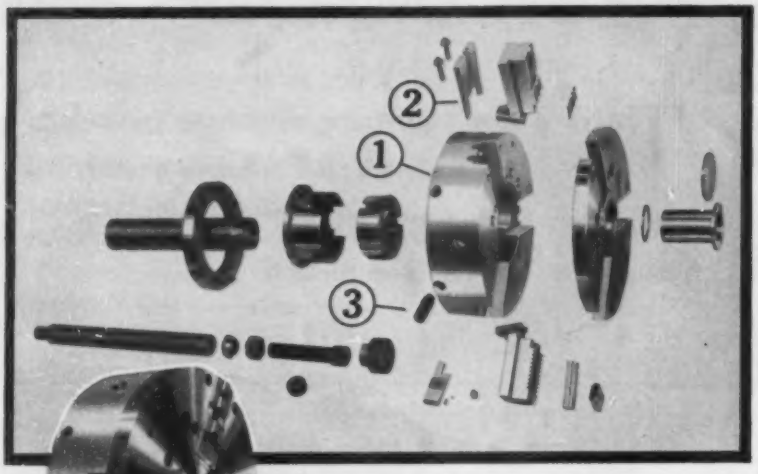

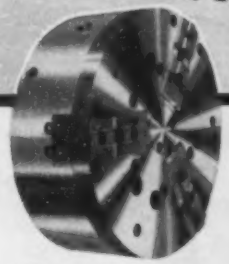

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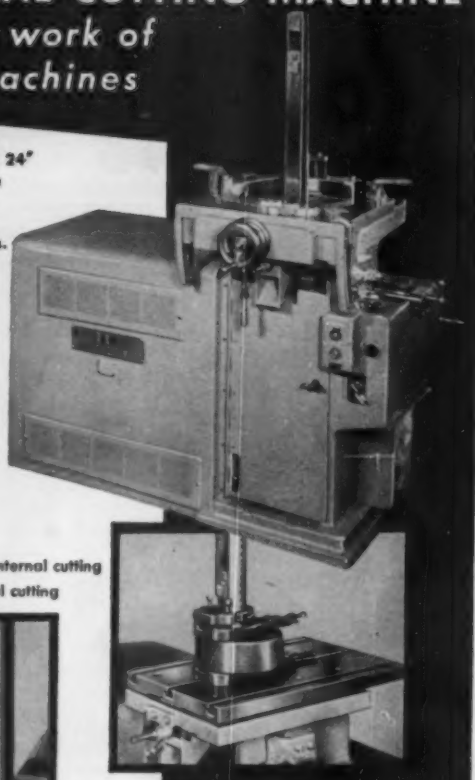
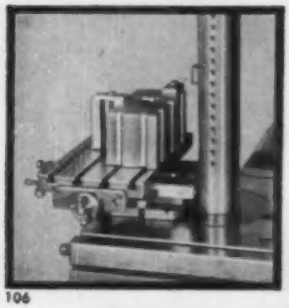


Right: Set-up for internal cutting
Below: Set-up for external cutting



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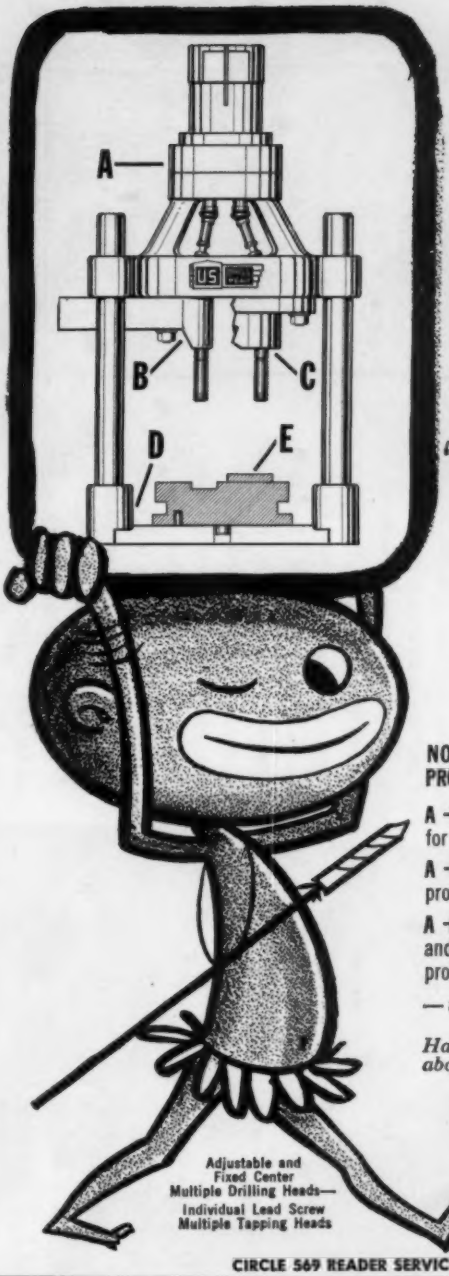

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